137

Scientific Review

AND

SCIENTIFIC AND LITERARY REVIEW,

A RECORD OF PROGRESS IN ARTS, INDUSTRY, AND MANUFACTURES,

INCORPORATING THE

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THE INVENTORS' INSTITUTE

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THE

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OBJECTIONS TO THE NEW PATENT LAW AMENDMENT BILL.

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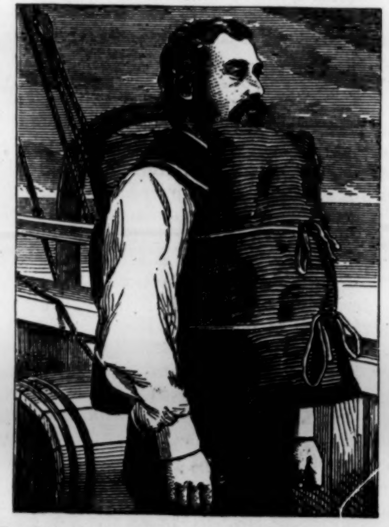
ARTHUR WOODS'
PILLOW LIFE PRESERVERS,
For the use of Crews and Passengers of Steam and Sailing Vessels, Yachts, &c., in case of Collision, Wreck, Stranding, or other Accident.



The Patentee begs to call the attention of all Shipowners, especially owners of Passenger Ships, to his Patent Pillow Life Preservers, and to solicit a trial.

The Patent consists of two Pillows, which are used as ordinary Pillows in a general way, but which can be made available for saving life if required. They are fitted with tapes to sling them over the head and tie round the body—one Pillow on the chest and the other on the back. The above Illustration shows the way in which the Pillows are attached to the person. The Pillows being made of a very buoyant material, act as a Life-buoy in case of danger, and the advantages are so manifest that they merely require to be enumerated, as follows:—

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3.—The protection they afford from floating wreck or dashing against rocks, &c.

4.—The fact that by reason of being tied to the person there is no occasion for holding on to them as to a common Life-buoy.

5.—The Pillows being lashed the narrow way across the chest and back, they do not interfere with the action of the arms in any way, and a person could swim, haul a rope, or pull an oar, without the slightest inconvenience.

6.—The slight cost is another feature—because the two Pillows being placed at the head of the mattress make the mattress so much shorter and consequently cheaper.

7.—These Pillows can be used as Boat Cushions at watering-places, and, in the event of a person falling overboard, or the boat upsetting, used as Life-buoys.

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APPLICATIONS FOR LETTERS PATENT.

*** In this list (Com.) means Invention communicated from abroad.

Further information, as to the progress of these Patents by Notice to Proceed, Sealing, and Specifying, can be obtained at the Office, 21, Cockspur-street, Charing Cross.

On January 13th.—137 to 147.—H. Law. Air-vessels, valves, and regulators for the supply of water to waterclosets, urinals, and lavatories, are also applicable to other purposes.—J. Hartley and Z. Sugden. Lawn mowers or machines for cutting grass.—J. H. Johnson. Sewing-machines (com.)—J. J. Wilson. Apparatus or fittings to be used in supplying and discharging hot and cold water and other liquids, part or parts of which are applicable for other purposes. H. Wilson. Combined ventilating "gulley" and trap.—A. Munro, B. Munro, and A. Dunlop. Machinery and cutters for cutting or shaping and polishing or surfacing stone, slate, marble, or similar substances.—J. H. Parker and T. Walker. Pickers used in looms for weaving.—G. Ackroyd. Apparatus for preventing the silver damaging the circles in Noble's or other combs.—E. P. H. Vaughan, F.C.S. Hinged double shoe for reaping and harvesting machines (com.)—E. G. Brewer. Reefing fore and aft sails of vessels (com.) (Complete specification.) W. Oliver and C. T. Owen. Motive power engines, and power brakes or apparatus for retarding and arresting motion and to power hoists or lifts.

On January 14th.—148 to 162.—C. Bohn. Pocket instrument for levelling and for measuring vertical angles.—T. Griffin. Hermetically sealing metallic cases used for preserved provisions or other purposes.—G. S. Hazlehurst. Apparatus for pumping liquids, and pumping and condensing gases.—J. Elce. Machinery for preparing cotton and other fibrous substances.—W. Sumner aad F. H. Waldenström. Metal tubes.—H. Codd. Apparatus for opening bottles having internal stoppers.—C. E. Caines and W. Mitchell. Braces for suspending trousers and other articles of dress.—T. G. F. Dolby. Machinery for the mannfacture of screw-caps or stoppers and hollow screws.—A. C. F. Franklin. Wheels for the propulsion of steam boats, and supporting and preventing the rolling of the same and other vessels.—T. Howarth. Drawing off and measuring liquids.—C. J. Galloway. Steam boilers.—G. Whyte. Couplings for railway carriages.—E. G. Brewer. Apparatus for the preservation of food and other substances and materials (com.)—A. Browne. Process of converting cast iron containing phosphoric impurities into steel or metal having the properties of steel (com.)—W. Harling. Electric disc and bell instrument for railway signalling, applicable also in part to other purposes.

On January 15th.—163 to 171.—J. H. Johnson. Production of stereotype plates, casts, and forms (com.)—J. Bolt. Stoppers for bottles, flasks, or jars.—G. Clark. Foundation of the surface of skating rinks. — S. Emsley and S. Smith. Winding and gassing yarns, and apparatus connected therewith.—J. Shaw. Steam engines.—J. Lynam. Stocks or holders for holding tools or cutters used in lathes, planing and shaping machines, and all descriptions of machinery, commonly called machine tools.—J. Chadderton, J. Allmark, and B. Haigh. Cut-off and governing valve for steam engines.—M. H. Smith. Apparatus for supplying fuel to furnaces.—T. Ryder. Stop motion, applicable to fibre machines on which "coilers" are employed.

On January 17th.—172 to 180.—J. Lansley. Horse shoes.—J. Allman and S. Turton. Low-water alarm apparatus for steam generators.—A. H. Louis. Writing pen.—D. Barbour. Weaving ornamental fabrics.—H. Deacon. Construction of "close," "blind," or "muffle" saltcake or other similar furnaces.—E. E. Wigzell and C. Halsey. Engines for steam launches and for other purposes.—J. C. Morgan, H. Macaulay, and F. W. Waide. Fireplaces, stoves, and apparatus for heating rooms and buildings.—J. G. Rollins. Machinery for sharpening saws (com.)—W. Johnson and J. Phillips. Traction engines and velocipedes.

On January 18th.—181 to 203.—F. T. Bond. Filtering and purifying water and other liquids—E. S. Norcombe. Modes of and apparatus for setting or adjusting and for threading th. needles of sewing-machines.—J. N. Fulton Sad or other pressing irons and soldering irons and in the mode of heating the same.—W. W Hill. Bottles, jars, and other vessels, and stoppers therefor.—J. J. Johnstone and J. Straiton.—Machines for cleaning long-haired and wooly skins.—J. H. Smiles. Construction of tubular boilers for steam-engines.—C. D. Able. Machinery for flanging boiler heads and other circular metal plates (com.)—J. Steel. Manufacture of gas and the machinery or apparatus employed therefor.—W. H. Andrew. Spades, shovels, hay and manure forks, and other articles having elongated handles.—J. B. Rogers and S. Anderson. Cork beds, available also as life preservers at sea.—M. C. Denne. Sewing machines.—W. L. Wise. Bleached ozokerite (com.)—W. Howitt. Roller skates—H. Hawkins. Apparatus used in the manufacture of gas.—F. von Grubinski. Machine for reaping and mowing. (Complete specification.)—J. Pilbrow. Construction of wheel or roller skates adapted for use upon artificial ice or other smooth surfaces or "rinks."—J. Cheshire. Rink or roller skate.—W. Little. Manufacture of cleansing and disinfecting fluids for washing sheep, and other purposes.—A. V. Newton. Cop tubes (com.)—H. E. Newton. Steam boilers or generators (com.)—L. Mottie. Treating tobacco.—A. V. Newton. Liquid meters (com.)—C. Asbury, Steam boilers.

On January 19th.—204 to 220.—E. G. Brewer Machines for sewing or stitching hosiery and other looped work (com.)—N. D. Garrett. Apparatus for signalling or communicating between passengers and guards of railway trains.—F. W. Webb. Mechanism for actuating and locking railway points and signals.—J. H. Kidd. Machinery for treating excreta, house refuse, and sewage sludge, to obtain manure or other products therefrom.—J. K. Martin. Bobbins and reels. — J. Badcock. Bustles or dress improvers for ladies' wear.—A. F. Kaufmann. Apparatus for starting cars and vehicles.—T. Messenger and G. D. Churchward. Steam and other engines.—W. E. Gedge. Sewing and embroidering machines (com.)—A. J. Sedley. Twin ship.—P. Jensen. Stopper appliance for bottles (com.)—M. Zingler. Manufacture of varnish, applicable to sizings and waterproofings for textile fabrics.—H. Curzon, G. G. Page, and C. Powis. Construction of roofs.—W. Tatum. Manufacture of emery cloth or paper, and paper, glass paper, and similar materials in tubular and other forms suitable for polishing metal and the like.—C. Churchill. Locking washer for securing screw bolts and nuts (com.)—A. Budenberg. Emery wheel grinding machinery (com.)—J. W. Morton. Apparatus for washing clothes and other similar articles.

On January 20th.—221 to 240.—A. C. Andrews. Waxed thread sewing machines—A. W. Turner. Apparatus for hair dressing and for grooming horses, partly applicable to the transmission of motion for other mechanical purposes.—J. C. Martin. Manufacture of white lead and apparatus employed therein.—L. Wild. Extinguishing fires in mills, manufactories, warehouses, and other buildings.—J. Hanson. Treating sewage and other foul water, and in deodorizing and utilizing urine to be used for manure.—J. Holgate. Shuttles used in looms for weaving.—A. O. Swett, H. N. Sheldon, and J. R. M. Squire. Metal turning lathes (com.) A. Clavier. Tanning and apparatus therefor.—J. Collins. Construction of converting vessels for the production of malleable iron and steel and the apparatus employed in their construction.—P. Lefébure. Apparatus applicable to tration engines and other locomotives or vehicles.—F. J. Demblon. Apparatus for moving rudders over on board ship.—G. H. Ellis. Portable skating floor or rink.—P. S. Justice. Apparatus to deaden the noise of exhaust steam, arrest sparks and cinders, and economise in the consumption of fuel on locomotive, marine, and stationary engines, steam and vacuum brakes (com.)—R. Werdermann. Wheels for locomotive engines.—T. Walker and J. Morton. Brace buckles or brace fastenings.—A. M. Clark. Mills for grinding (com.)—I. Levinstein. Treatment of residues arising from the manufacture of magenta.—E. W. Corns. Fastenings for scarves and neck ties.—H. H. Murdoch. Manufacture and refining of sugar (com.)

COOKING BY COLD.

It is a curious fact, not generally known, that the action of intense cold on organic substances is similar to that of a high degree of heat, and that, when subjected to a very low temperature, meat can be brought to a condition similar to its state when cooked by actual warmth. Quite recently a Hungarian chemist, Dr. von Sawiczewsky, who, it appears, has investigated all its various ways suggested for preserving meat (by chemicals, cooking by heat and harmetically sealing, etc.), and has found points of objection to all, has attempted the preparation of the material by subjecting it in a perfectly fresh state to a temperature of 33° below zero, Fah., and sealing it afterwards in tins. Although partially cooked, and thus requiring less fuel to complete its preparation for the table, it is entirely without the taste of meat which has been partially subjected to any heating process, and may be roasted, boiled, or otherwise treated, the same as if it were fresh. A commission appointed by the German Governments has lately conducted a series of careful and successful experiments upon the process; and as a final test two corvettes of the German navy, being about to circumnavigate the globe have been supplied with a large stock. An extensive factory is being credted in Hungary for its manufacture.

DRAMATIC LITERATURE.

ROYAL OPERA COMIQUE, STRAND.

During the month we had the pleasure of witnessing the performance of Offenbach's opera bouffe, in three acts, "Madame L'Archiduc," Miss Emily Soldene being the representative of that spirited lady; with Miss Kate Santley as Fortunato, and Mr. W. J. Hill as the Archduke. This piece has been played for upwards of one hundred nights lately at the Bouffes in Paris, with Madame Jubigne as the Archduchess, a comparatively new actress, and a great favourite. A theatregoer, who is an admirer of Jubigne (a Frenchman), informs us that Miss Soldene's rendering is good, and we are inclined to believe him after witnessing the performance. Some Frenchmen among the audience exhibited a little enthusiasm. The last act (the pavilion in the archducal grounds) is the most brilliant, and at the same time very amusing. The duke is enthroned amongst a grand retinue. The way in which, as a somewhat *passé petit-maitre*, he constantly interrupts his harangue to the courtiers, by desiring them to stand aside that he may survey the beauty of Marietta, the Archduchess, considers her charms, and kisses his hand to her, with such exclamations as "delicious creatyah!" is very ludicrous. Mr. Hill is a refreshing actor, because he takes the trouble and has the talent to be palpably comic and true to life without the least vulgarity. Persons who can follow an artistic effort, and are able to enjoy a good laugh, should take an opportunity of noting his acting critically. In this act Miss Soldene is magnificently dressed in a military riding-habit. She has apparently studied motion on the stage; so that not a little was said by twitchings of her skirt, swaying of the arms and body, and alteration of place. A good contralto voice carried off her songs with applause. Almost more of the singing fell to Fortunato (Miss Santley). Her voice is of the opposite type, and pleased much in the commencement of the Pavilion scene. This lady, whose style possesses a good deal of amiability, gave the audience a very sprightly and fascinating captain, who would have been irresistible in the garrison towns of the period. Duets are a characteristic of this opera, and they are generally pretty. The dresses are in the pretty Louis IV. style, and very rich.

OLYMPIC THEATRE.

The play of the "Gascon" has had a good run at this theatre, the lessee, Mr. Neville, and Mrs. Rousby filling the principal parts. The ill-fated, beauteous Mary Queen of Scots figures to a considerable extent in the drama, and Mrs. Rousby is the interpreter. An anomaly was rather apparent that she had dark hair, whereas the Queen of Scots had splendid light hair. Mrs. Rousby's impersonation was apparently an earnest effort to do justice to the Queen. Mr. Neville showed he was a good actor, and his elocution is a great attraction. At this theatre the public will find a rather handsome drawing-room entertainment on the stage, the dresses being in unison, and the scenery superior to that at several of the theatres of greater pretensions. Spectacular goodness is always a desirable feature.

ROYAL STRAND THEATRE.

A brilliant little comedy in three acts is being performed at this theatre at present; it is the staple piece of the evening. "A Lesson in Love," by Charles S. Cheltnam, is, as Miss Swanborough (Mrs. Sutherland, a charming widow) informed the audience at the end, designed to show young people the necessity of careful behaviour in such matters in order to ensure their success in love-making. Quite reversing the judgment of the elder Weller in the case, Miss Swanborough appeared to take the audience with her in her rendering, and, indeed, displayed much liveliness and captivation. The difficulty in doing justice to such a character would necessarily be to avoid anything hackneyed, and to be in unison with the spirit of good society of the day This actress, however, whom we have often admired in burlesque, and whose excellent songs we miss in the present comedy, fully satisfied all necessary requirements. This piece affords a good representation of fashionable life, and is very amusing. The charming widow was brought before the curtain several times. The other characters, Miss Leslie, the widow's neice; Babblebrook, nicknamed the Newspaper; Orlando Middlemark, and Captain Freeman were well sustained by Miss Marion Terry, Mr. Harry Cox, Mr. Vernon, and Mr. Graham. A short and exceedingly ludicrous burlesque, "Cracked Heads," followed, with some good singing and acting by Misses Lottie Venn and Angelina Claude. The authors are Arthur Clements and Frederick Hay. A farce terminated the entertainment, in which Mons. Marius and Mr. Terry appeared.

PATENTS FOR INVENTIONS BILL, 1876.

WITH SUGGESTED AMENDMENTS.

At a Conference held at Sir Antonio Brady's offices, 110, Cannon-street, E.C., at which were present Sir Antonio Brady, Admiral Selwyn, Dr. McGrigor Croft, Messrs. S. Calley, Lancaster, Allardyce, J. M. Hyde, and M. M. Harris, A. J. Murray (Inventors' Institute); Messrs. T. Paterson, T. Mottershead, H. Broadhurst, and S. Brighty (of the Artisans' and Inventors' Patent Law Committee), Messrs. Gardner, W. Smith, C.E., Gray, C.E., Lloyd Wise, C.E. (London Patent Agents), G. Odger (National Trades Congress Parliamentary Committee), F. W. Campin (Secretary Inventors' Institute), and others, the following suggestions, as regards the Lord Chancellor's Bill, 1876, were made:—

PATENTS FOR INVENTIONS BILL, 1876.	SUGGESTIONS.
1, 2, 3, 4. Preliminary.	Note.—*The numbers in both columns are those of the clauses in the Bill. Clauses not given in full are those not thought objectionable and are similar to the Bill of last Session. See* Scientific Review *for March*, 1875.
5. Commissioners.—The Commissioners of Patents for Inventions (in this Act referred to as the commissioners) shall, from the passing of this Act, be the Lord Chancellor, the Master of the Rolls, the two Law Officers, Her Majesty's Advocate and Solicitor General for Scotland, and Her Majesty's Attorney General and Solicitor General for Ireland, and such five other persons as Her Majesty, from time to time, by warrant under Her Royal Sign Manual (on the recommendation, as regards two, of the Lord Chancellor, and, as regards the others, of the Board of Trade) thinks fit to appoint to be commissioners during Her Majesty's pleasure. The commissioners shall have an office called the Patent Office.	(5.) That the Commissioners should be persons specially qualified for the office by their knowledge or attainments, and able to devote their whole time to the work.
6. Examiners and Assistant Examiners.—There shall, after the passing of this Act, be Examiners and Assistant Examiners of Patents (in this Act referred to as the examiners and assistant examiners). The number of the examiners shall be two, and the number of the assistant examiners shall be two or more, not exceeding four, as the Lord Chancellor, with the consent of the Treasury, from time to time directs. The examiners and assistant examiners shall be appointed by the Lord Chancellor by writing under his hand. They shall be specially qualified for the office by legal or scientific knowledge. The instrument of appointment in each case shall state that in the opinion of the Lord Chancellor the person appointed is so qualified.	(6.) That the number of examiners and assistant-examiners should be such as the Lord Chancellor, or the Commissioners, with the consent of the Treasury, from time to time directs; having regard to the work to be done.
7. Application: Proceedings thereon.—An application shall be made by the applicant filing at the Patent Office the prescribed form of application and declaration, and a *specification describing the nature of the invention. Notice of the application shall be published. Any person having an interest in opposing the grant may within the prescribed time file notice of opposition, with particulars of his objections, and every person so filing a notice of opposition is in this Act referred to as an opponent.	(7.) Word "*provisional*" to be inserted at * before specification.
8. Provisional protection.—(Same as Bill of last year.)	(8.) Agreed to.
9. Reference to examiner.—(Similar to Bill of last year; but now the examiner is to take action "*on the request of the applicant*.")	(9.) Agreed to.
10. Report of examiner.—As to (*a*.) Whether the invention is a proper subject for a patent within the Statute of Monopolies: (*b*.) Whether the specification is sufficient: (*c*.) Whether the invention appears open to objection on the ground of want of novelty, as far as can be ascertained by such examination as prescribed of former specifications and other documents and publications in the Patent Office: (*d*.) *Whether, by reason of the frivolous character of the invention, it is not worthy of a patent.*	(10.) That sub-section *d* be struck out.
11. Reference to and report by law officer.—(*Inter alia*), the reports shall be annexed to and shall always go with the specification.	(11.) The annexation of and publication of reports are objectionable on account of increased expense and the clumsiness of patent records that will thereby be created.
12. Notice to proceed.	(12.) Agreed to, with the proviso that the six months' provisional protection commence only after all Patent Office requirements are fulfilled.
13. Preparation of patent and warrant.—If the law officer has reported against the application, the applicant may, after notice to proceed, petition the Lord Chancellor for the grant and sealing of a patent.	(13.) Agreed to.
14. Petition against sealing.—"Any person* may petition the Lord Chancellor against the sealing of a patent."	(14.) Add at * the words "*having an interest.*"
15. Time for sealing.—A patent shall not be sealed unless a request for the sealing thereof is made within three months from the date of the warrant, and within the period of provisional protection. Every patent shall be sealed within seven days before the expiration of the provisional protection, and not sooner. Every patent shall be dated the day of the application;* but it *shall not be competent for the patentee to take any proceeding* in respect of an infringement committed *before the publication by the commissioners* of the application, specification, and relative documents and reports.	(15.) Agreed to, except objection to last paragraph; because the clause, as it stands in the Bill, would annul the provisional specification. Strike out all words after "application."
16. Sealing, extent, and duration of patent, fourteen years.—Every patent shall be sealed, or *impressed with a stamp*, as prescribed, and, when so sealed or impressed, shall be deemed to be sealed with the Great Seal of the United Kingdom, and shall have effect throughout the United Kingdom. The term limited in every patent for the duration thereof shall be fourteen years from its date.	(16.) Agreed to, except term, which should be twenty-one years.

17. Notwithstanding anything in this Act, an applicant may obtain, on petition to the Lord Chancellor, such extension of time as the Lord Chancellor thinks fit, in the cases and to the extent following:

(1.) Extension of the period of provisional protection, so that it be not extended beyond twelve months in the whole from the date of the application:

(2.) Extension of the time within which a request for sealing is to be made:

(3.) Extension of the time within which the patent is to be sealed;

and in every such case everything done or happening within the extended time shall be deemed to have been done or to have happened within the time originally allowed by this Act.

(17.) Agreed to.

18 Renewal.—A patent shall, notwithstanding anything therein contained, cease at the end of the third or seventh complete year of the term for which it is granted, unless before the respective end thereof the patentee takes out at the Patent Office a certificate of renewal, which shall be granted on his request in writing.

But if in case, by accident, mistake, or inadvertence, the patentee fails so to take out a certificate of renewal, he may apply, by petition, to the Lord Chancellor for an enlargement of the time for taking out the same; and thereupon the Lord Chancellor may, if he thinks fit, enlarge the time accordingly, on such terms (if any) as to him seem just, subject to the following restriction and condition:

(1.) The time for taking out such a certificate shall not in any case be enlarged so as to extend beyond three months from the expiration of the third or seventh year aforesaid (as the case may be):

(2.) No proceeding shall be taken in respect of an infringement committed within the enlarged time, unless leave to take such a proceeding is made part of the order for enlargement.

(18.) No other fees should be charged than those payable on granting, provided that no more than £10 be the total fee, and that provisional protection be obtainable for £1.

19. Foreign and Colonial Inventions.—Where the invention in respect of which an application is made was not first invented in the United Kingdom, or the applicant is resident out of the United Kingdom, or is a subject or citizen of a foreign state, wherever resident, the following provisions shall have effect:

(1.) A patent shall not be granted after the expiration of a foreign patent for the invention, and, if so granted, shall be void:

(2.) If at the time of the application there is a foreign patent for the invention in force, a patent shall not be granted unless the foreign patentee (by himself, or by his attorney or agent,) is the applicant, and his application is made within six months after the date of the foreign patent, or of the earliest foreign patent (if there are more than one):

(3.) The publication in the United Kingdom of the invention by the circulation or republication of the foreign patent, or of a specification connected therewith, shall not affect the validity of the patent:

(4.) If at the time of the application there is not a foreign patent for the invention in force, a patent shall not be granted unless the applicant declares himself to be the first and true inventor, or declares and shews himself, as prescribed, to be entitled in law, by assignment or otherwise, to all the rights in respect of the invention of the first and true inventor; and no patent shall be granted in respect of a communication from abroad:

(5.) The patent shall cease on the cesser of the foreign patent (if any), or of such one of the foreign patents (if more than one) as first ceases.

For the purpose of this section, any grant of privilege for the monoply or exclusive use or exercise of an invention in a foreign country shall be deemed a foreign patent.

The provisions of this section relating to a foreign patent shall extend and apply to a colonial patent (that is, a patent granted in any part of Her Majesty's dominions out of the United Kingdom).

(19.) Alter term of application to twelve months, Cesser not to apply to colonies.

20. Foreign vessels in British waters. (*See Act of* 1852).

(20.) Agreed to.

21. Amendment.—An applicant or a patentee may, by request filed at the Patent Office, seek leave to amend his specification by way of disclaimer, explanation, supplement, or otherwise, stating his reasons for the same.

Where the request is made pending the application, it shall be proceeded on and dealt with as prescribed.

Where the request is made by a patentee, it shall be proceeded on and dealt with in all respects (as nearly as may be) as an application.

An amendment by way of supplement shall not be allowed unless the applicant or patentee declares himself to be the first and true inventor of the supplementary invention, or declares and shows himself, as prescribed, to be entitled in law, by assignment or otherwise, to all the rights in respect of the supplementary invention of the first and true inventor thereof, nor unless the supplementary invention is such as, if known at the date of the application for the original patent, might have been properly comprised in the specification on that application.

Where leave to amend otherwise than by way of supplement is granted, care shall be taken that any amendment be not allowed if it would make the specification as amended claim an invention substantially larger than or substantially different from the invention claimed by the specification as it stood before the amendment.

An amendment shall not be admissible in evidence in a proceeding pending at the time of request for leave to amend, except a proceeding for revocation of the patent.

Where an amendment is allowed after the patent is sealed, no proceeding shall be taken in respect of an infringement committed before the amendment, unless leave to take such a proceeding is made part of the leave to amend.

Leave to amend otherwise than by way of supplement, and except in case of fraud, shall be conclusive as to the right of the party to amend.

(21.) That paragraph 5 be altered so as to allow any necessary and proper alteration of title or description of invention.

22. Revocation.—The proceeding by scire facias to repeal a patent is hereby abolished.

A patent shall be liable to be revoked on petition to the Lord Chancellor on any ground on which a patent might at the commencement of this Act be repealed on a proceeding by scire facias, and on any ground specified in this Act.

(22.) Agreed to, except last clause, no revocation except on proof of prior publication and commercial user.

23. Assignments. Licences.	(23.) Agreed to.
24. Register of Proprietors.—Until an entry of an assignment of or licence under a patent is made in the register the original patentee shall be deemed to be the sole proprietor of the patent, *and not to have granted any licence thereunder*.	(24.) Agreed to.
25. Correction of register.—The High Court of England, or judge thereof, may, at the instance of any person deeming himself aggrieved by any entry made under colour of this Act in the register of proprietors, make such order for expunging or varying that entry, and with respect to the costs of the proceedings, as the court or judge seems fit. The entry shall be expunged or varied accordingly.	(25.) Agreed to.
26. Patent revocable if not used or licences not given.—A patent shall be liable, at any time after the expiration of two years from its date, to be revoked on either of the following grounds: (*a.*) That the patentee fails to use or put in practice the invention, by himself or his licensees, to a reasonable extent, within the United Kingdom, or to make reasonable efforts to secure the use or practice thereof there, proof of the contrary whereof shall lie on him: (*b.*) That it is made to appear to the Lord Chancellor that, in order to ensure a proper supply to the public of articles produced under the patent, or proper means for the use of the invention by the public, licences are necessary, and the patentee fails to grant licences to proper persons requesting the same, on terms which the Lord Chancellor, having regard to all the circumstances of the case, deems reasonable.	(26.) *Most objectionable.* No compulsory license unless on the basis of a per centage of manufacturers' profits can be sanctioned by inventors. No legal authority, even if aided by assessors, can decide what is a reasonable rate, and in any case the liability should not be one of revocation, but simply enforcement of a mandatory order for a license in terms such as above stated.
27. Protection of inventions at exhibitions.	(27.) Agreed to.
28. Patent to first inventor not invalidated by application in fraud of him.	(28.) Agreed to.
29. Falsification of entries in register.	(29.) Agreed to.
30. Penalty for unauthorized use of name of patentee, mark of word, patent, &c.	(30.) Agreed to.
31. False declaration a misdemeanour.	(31.) Agreed to.
32. Patent to bind Crown.—A patent shall have to all intents the like effect as against Her Majesty the Queen, her heirs and successors, as it has as against a subject. But the officers or commissioners administering any department of the service of the Crown may, by themselves, their agents, contractors, or others, at any time after the application, use the invention for the service of the Crown, on terms to be, before or after the use thereof, agreed on, with the approval of the Treasury, between those officers or commissioners and the patentee, or, in default of such agreement, settled by the Treasury; and the use and application of the invention under this section during the period of provisional protection shall not prejudice the grant of a patent for the invention.	(32.) Highly approved of, in so far as it renders the Crown liable for the use of a patent, but objected to as regards the power of the Treasury, which would not be a good or fair judge of what should be paid. All remuneration should be dependent on the use of the invention by the public.

On 33 to 44—Relating to Procedure—it was observed that no opinion could be pronounced except that procedure ought to be much more simple than at present or than this Bill would appear to make it.

On 43 to 50—Relating to Commissioners and their Powers of Making Rules, Patent Office, &c.—it was observed that the rules ought to be submitted to Parliament before coming into operation; also, that no power to compel the deposit of models ought to be given.

On 51—Stamp Duties—it was resolved that these ought to be limited to £10, provisional protection to be obtainable for £1.

On the remaining Clauses, 52 to 62—Special Provisions as to Scotland and Ireland, Transitory Provisions, and Saving Clauses all similar to the Bill of last year and the present law—no observations were offered.

Reviews.

DANGER TO THE EARTH.

"The Earth in Danger." By ALEXANDER WATT, author of "Electro-Metallurgy," &c., &c., and formerly Joint Editor of the *Chemist*. London: E. W. Allen, 11, Ave Maria-lane, and C. H. Clarke, 13, Paternoster-row.

THIS is a funny little pamphlet, half joke and half earnest, which we present to the notice of our readers as worthy of perusal for their amusement, and also for some important hints it may afford them.

It is with no desire to be considered an alarmist, says the author, that he addresses himself to the reader upon a subject of no little importance—the present condition of the great globe upon which

"We live and move, and have our being."

That the earth, externally and internally, has undergone many changes, especially during the present century, no one will deny; and these changes, or alterations in its normal condition, have been wrought, not by nature, but by man.

Man, ever striving to meet the requirements of every-day life, discovered a combustible material in the bowels of the earth infinitely superior to wood as a fuel, namely, coal. In this he not only obtained an efficient and economical fuel, but also the means of illumination; and how he has taken advantage of this grand discovery of coal! Behold the vast subterranean vaults he has formed beneath this earth of ours! See how he has hollowed and scooped it out, as a ploughboy would a turnip, not stopping to fill it up again, but has kept on, and still keeps on, hollowing and scooping it out, until the earth is a mere cockle-shell in some places; and the wonder is that whole villages, houses, inhabitants, and all, do not fall through the slight terrestrial crust that separates them from the depths below. But man wants coal, and, having once found it, he will not rest satisfied until he has burnt every pound of it, and then he will have to find a substitute—if he can.

As the earth became more thickly peopled, and the inhabitants of great cities accumulated in such vast numbers that they could scarcely walk the streets without jostling against each other, man's ingenuity led him to discover some means by which a great part of the population might be conveyed to the suburbs of each city, as it were, to make room for others. The ordinary means of conveyance not being extensive or swift enough to accomplish this, he turned his attention to steam as a motive power, and in progress of time the steam engine was perfected, steamboats and railways were constructed, and thus those who do business in great cities are enabled to live many miles from the scene of their daily enterprise. And how advantage has been taken of this grand discovery of steam! Behold the countless thousands of miles of railway in every part of the civilized world! Behold the countless myriad steamships that plough the waters with their freights of human beings and of wealth! Look at the manufactures (surely a misnomer now!) mainly carried on by steam-power in every part of the globe where the hand of civilization holds sway!

But man *will* progress, and having once discovered the use of steam, he will employ it until he finds a substitute; this he will have to do some day, when he has burnt up all his coal; most likely electricity will then be his motive power—"Necessity is the mother of invention." At present coal and steam are dependent upon each other to a great extent; when the one fails the other will have to "cave in," for no one would think of heating a boiler with a bundle of sticks.

Having now abandoned the old, rusty hackney-coach, doing its five miles an hour badly, for the glorious express train, doing its forty miles well, man would not rest until he found a more ready way of conveying his thoughts from place to place than the General Post afforded him, even when conducted by steam. Steam was all very well to carry him to or from his place of business, or into the country at holiday time; but to have to wait twelve, or perhaps twenty-four hours for a reply to a letter, the idea was monstrous! He must have something quicker than that. So the telegraph had to be discovered; and we all know how quickly and how well that was done. Thus, for a time, he was tolerably content; he could send messages to any part of Great Britain and receive a reply in less than an hour; but to have to wait nearly a whole month for a reply from America, that he would never stand! So they had to lay a cable—three thousand miles long, mind you!—between Ireland and the United States, and thus he could send a message and receive a reply in a few minutes. That was glorious, indeed, and he ought to have been happy; but, alas! no; there were his relatives in the Antipodes—some sixteen thousand miles away—they must be brought closer; there was only one way to do it (until we get a tunnel through the earth, with trains every five minutes, Sundays excepted), there must be a cable to unite Great Britain and Australia. No sooner said than done, and now man can ascertain, an hour or so after it has happened, who won the cricket match at Melbourne, the English team or the Antipodal. This is progress, indeed.

And thus man has gone on, binding country to country by copper connecting wires, until all are united, and John Bull holds the terminals—may he never let go his hold!

But is all this playing with metals and steam and coal-burning safe? That is the question. Is this globe of ours, which, for some four or five thousand centuries, was covered with non-metallic matter—now that its surface presents many millions of miles of metallic-conducting material—as safe to dwell upon as ever it was? Does it make *no* difference to its security as a planet whether the earth has a metallic or non-metallic exterior? If there are millions of miles of iron rails, and wire, and lamp-posts, and railing, and machinery, and the thousand and one other steel and iron matters on the surface which were not at the beginning, will it make *no* difference whatever to the magnetic influence of the North Pole? Is there no limit to the extent of iron and steel that may be taken *out* of the earth, and put *upon* it with impunity? Can anyone answer these questions upon scientific principles, and say, "Oh, yes! you may go on as long as you like; take all the iron out of the earth, smelt it, cast it, polish it, and then cover half the globe with it, and the earth will not be one jot the less safe as a dwelling for man." Can anyone *prove* this scientifically?

It is a well-known fact that electricity is generated by a jet of steam. This was very ably illustrated many years ago by Armstrong's hydro-electric machine exhibited at the Polytechnic Institution. The author can well remember being in the laboratory of that institution during the time when Armstrong's machine was being exhibited, and to his great astonishment one day he found that the hairs of his head were being drawn up to the gas-burner, which was some inches above his head. On placing his knuckle near the burner, sparks were as freely obtained as from the prime conductor of an electrical machine. Now, the gas-burner spoken of was probably more than a hundred feet from the hydro-electric machine; it was not in metallic connection with it, and, moreover, was in the underground laboratory of the Polytechnic, whilst Armstrong's machine was being exhibited on the stage of the lecture-room in the rear of the building. There can be no doubt, therefore, that the whole atmosphere of the building, while the machine was kept in action, was charged with electricity; and the current, seizing the best conductors at hand, ran along the gas-pipes, and finally found its way into the laboratory below.

Now, if steam generates electricity (and we know it does), what a vast amount of this fluid must be set free by the various steam-generating machines which we have in all parts of the world at the present time! And what becomes of the fluid thus set free? Again, friction generates electricity; and lo! what an amount of friction there is constantly going on, day and night, year after year, all over the world compared with (say) forty years ago! What becomes of the current generated by friction?

Until the electric fluid has done some work—by which its power becomes annihilated or subdued—does it not accumulate and remain *in statu quo* until its "receiver" becomes surcharged, when it may break its bounds with a violent explosion? As a Leyden jar will break when overcharged with the electric current, is it not reasonable to infer that where the earth's surface becomes surcharged, it must, in time, give way, and an eruption take place in the form of an electrical earthquake?

The theory upon which our remarks are founded was first promulgated in a work entitled "The Vagaries of a Pen,"* published in the autumn of last year, and ran as follows:

"THE EARTH'S SURFACE.

"Well, it isn't what it used to be, that's all I know about it. What with their taking out its inside and putting it on the top, for their coal, and slate, and lead, and tin, and iron, and one thing or another, the surface of the earth is not what it used to be—nor its inside either. In fact, they have regularly turned it inside out. Look at the millions of tons of coal they take out of the earth's interior and burn to a cinder! But this is not half so bad as taking out all its iron—from where it was doing no harm—and smelting it, and refining it, and then going and sticking it all over the outside of the earth in thousands upon thousands of miles of railway—covering it with metal, mind you, an electrical conductor! Look at the electricity that is generated by their steam, and the friction on the railways! What becomes of it? It isn't decomposed; it does not run away to nowhere! Not a bit of it; the earth keeps on bottling it up, and bottling it up until she becomes like a Leyden jar, and if they don't take care she'll get overcharged and *bu'st*. Why, it is only a few years ago since we had an electrical earthquake, and there was the current running along like mad—through county after county, over hundreds of miles. Of course, when the electric fluid is generated in buckets full, and the earth at last becomes saturated with it, we may expect a 'bu'st up.' What's the good of its being a power if it doesn't exert itself? Why don't they take and use the electricity, by collecting and saving, and then utilizing it in some way? What's the good of wasting it? If I had such a fine lot of apparatus, and such a capital head as Professor Tyndall, or any of those clever fellows, I'd make a lot of experiments, that I would; I'd go down to the railway lines, after I'd had my morning's pipe, and take an electrometer and a little copper wire and some solution of silver, and try to collect the electricity, and use it there and then. That's what I'd do. And not only that, I'd have some of the rails taken up and insulated, so that they should not be in contact with the earth, and in this way I'd soon see if it would not pay to have 'em all up and put down again on sleepers that shouldn't have much conductibility about 'em. But lor! I could never do such a thing; it wants a sharp chap like Tyndall. Wouldn't poor Faraday have liked to have a go in at utilizing the electric fluid?

"And, then, again, there's the North Pole; now, she's jolly fond of iron and steel, and I rather fancy she's got her work cut out to avoid being influenced by those blessed rails which are pretty nearly all over the world. Why, if we go on for the next forty years as we have during the past forty, there will be enough iron on the earth's surface to give the North Pole some trouble. I don't much mind their taking and sticking a lot of copper wires under the sea—they're covered with gutta percha, so they can't do much harm; but to go and cover the earth with iron rails and not expect it to make any difference to the earth's condition and all that sort of thing, surprises me. And, then, again, look at the millions of miles of telegraph wire they've propped up in the air—sometimes thirty or forty of 'em at a time! Do you mean to say *they* won't make any difference to the electrical condition of the air? Why, we're all wires and rails and conductors now, and yet we sit coolly looking on as if it didn't matter whether the earth was covered with conductors or non-conductors. There's stuff for you! Why, anyone might think we were a lot of babies. People are always saying, 'Ah, the seasons are changed from what they used to be; when I was a boy, I recollect, &c., &c.' Of course; but then, you know, that was fifty years ago, when there wasn't a blessed railway or an inch of galvanized wire in the world. Look at the difference now!

"Now, what I propose is this, and I don't care who laughs at me for saying so—it isn't so bad as trying to prove that the earth is flat, or the moon made of green cheese. Well, I propose, as I have said before, that science should set to work in earnest to make a few experiments in the direction indicated; I shall be glad to lend a hand, for I know something of these matters, and can offer a few suggestions which may tend to solve the problem whether we can cover the earth with metal and generate a lot of electricity with impunity. Let somebody think this over seriously, and if they entertain my views, all I say is, *let something be done*. I don't want electrical 'Vagaries' to go and do a heap of harm if it can be prevented; and if science can do one thing, she can do another. If she will generate electricity, the least she can do is to use it."

The above extract, although written in a humorous fashion, contains the proposition that the electric fluid generated by our railways should be utilized in some way or other if possible; and as there is

"Many a true word spoken in jest,"

so there may be truth in the supposition that the electricity set free by our railways is being "bottled up" in the earth until some day—at any time—electrical earthquakes may occur in any part of the globe. As to the term "bottling up," we know that electricity can be easily bottled up, and, for experimental purposes, this is very frequently done. We know, also, that *light* can be bottled up, and its chemical action upon sensitized paper brought into play a very considerable time after it has been so bottled up. We also know that electricity accumulates naturally, not only in the earth but in the air, and that when this vast accumulation arrives at a certain point, violent thunderstorms are the result. Now, if to the natural production, or development, or setting free of the electric fluid we add the vast amount produced or set free by our railways, &c., &c., may we not in common reason expect violent, even terrible, consequences? Is there anything preposterous in this idea? Is it not, on the contrary, not only feasible, but more than probable?

There is no power with which we are acquainted, not even heat, which is so terrible, so appalling in its effects, as that subtle fluid known as electricity. Unseen, it accumulates in the earth's crust and in the floating clouds above until the time comes for its destructive influence to be felt, when houses and trees are levelled with the earth, cattle are stricken, and man, while pursuing his daily toil, is laid prostrate by the devastating invisible force. But all this occurs naturally; should we, then, knowing its vast power, add to the already mighty accumulation of this fluid by allowing our railways and other electricity-generating machinery to increase and go on increasing the subtle devastator without making an effort to avert, if possible, its dangers? Electricity is a useful power, and may, one day, become the most useful of all forces with which man has to deal. It may, hereafter, be the motive power by which railway trains and ships will be propelled; it may, some time, be the chief source of illumination in cities and in private dwellings. When we know more about it, electricity may be the means of enabling us to traverse the air as we now do the ocean, when we shall laugh at the idea of *not* being able to go from place to place in an aërial vessel as a common mode of transit.

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* "The Vagaries of a Pen," by VERSATILIUS. London: C. H. Clarke.

The author then refers to the development of magnetism in rails and other matters, from reviewing which he presents us with the following:—

So the time must come when Great Britain, at least, will have raised the last shovelful of her favourite fuel; she will then be dependent upon importation until that stops, and an European war would soon put an end to that source of supply. This is not a pleasing prospect for a country whose wealth and prosperity so greatly depend upon an unlimited supply of coal and iron. And when all the coal that man can find in this island has been removed from its bed and submitted to the process of combustion, England, as a place to dwell in, will somewhat resemble an egg that has been "blown," and its contents swept away from it. In some parts of England, at least, persons will live in very doubtful security; for it is a very well known fact that in some places where they have worked the mines too close to the surface, the miners, when at work, have distinctly heard the rolling of carriage wheels above; and the wonder is that in many instances the comparatively thin shell of earth did not fall in upon them.

There is another point, also, which it may not be out of place to refer to in a treatise of this nature: it is this—Has the earth increased or decreased in weight since the beginning? We do not for a moment imagine that it has lost in weight, for, although we have, by combustion, destroyed or changed millions upon millions of tons of combustible material, the elements of which such material was composed of course still remain upon the earth's surface in some form or other. In the destructive processes which the combustible matter undergoes there is no actual loss.

Well, then, on the other hand, has the earth *increased* in weight? To this we reply, most undoubtedly. Look at the countless myriad of meteoric stones, or aërolites, that have, from time to time, throughout all time, probably, fallen upon the surface of our planet. Besides those which man has periodically discovered in all parts of the world, how many may have fallen into the invisible depths of the mighty ocean? Captain Markham, in his interesting description of the arrival of the recent Arctic Expedition at Disco, alludes to the quantity of meteoric stones which the Swiss took away from the coast of Ovifak in 1871; and these remarkable masses, often possessing considerable weight, have frequently been picked up in various parts of the earth, many of them deeply embedded in the soil. Considering that our earth is composed of about twh-thirds water, how many of these ponderous stones may, in the course of centuries of time, have found their way into the bosom of the deep unseen by man?

If, therefore, the earth is heavier now than it was at the beginning, and if it continues to receive showers of solid meteoric matter, will its distance from the other planets be in any way affected? Will not the planet, or planets, from which the aërolites have been expelled be *so much lighter*, while the earth becomes heavier, by the loss which these masses of ponderable matter must entail? These are considerations which, however strange they may appear at first sight, cannot be wholly without interest. If the accession to the earth's natural weight *does* affect its position—its *original* distance from other planets—may not this eventually, if it has not done so already, affect our seasons? Be this as it may, the falling of meteorolites upon our earth is but a natural dispensation, and, beyond speculating as to the ultimate effect of such an addition to the earth's natural weight, we can do nothing. It is not so, however, with respect to the artificial production and accumulation of electricity on the surface of the globe, and the vast transposition of her metallic interior to the outer surface of her crust; for if, on investigation, we find that we have committed an error in suffering an abnormal accumulation of a powerful and dangerous, though unseen, force, to imperil our security, it becomes our duty to seek a remedy, if we can, while there is yet time.

"And how is this imaginary danger to be averted?" is the first question that will naturally arise. To this we reply, let us utilize the electric current which is produced by our railways, if it be possible; let us collect the fluid by proper conductors, and employ it in some of our manufacturing operations—decomposition or electrolization of chemical substances, the electric light, the telegraph, &c. &c. In a thousand and one ways electricity may be used, and, being used, will be rendered harmless. To do this it may be necessary to place our railway lines upon insulating sleepers. Well, this could be done, and it would be a very simple experiment to lay down a certain length of line, with the "metals" insulated, so that the electricity, now wasted, would be conducted by copper wires into, say, a strong solution of common salt, the current would soon convert this into soda, and thus a positive gain would be effected independent of the advantages which would result from checking the accumulation of the electric current at the earth's surface. After the first cost of insulating the railway metal, the electric current would be obtained for nothing, it being, at present, a waste product.

However chimerical this proposition may appear at first sight, there can be no doubt whatever that at least it is worth a few experiments to establish the fact whether the artificially-developed, and ever-wasted electricity of our railways is worth saving and utilizing. If, as we believe, such is the case, the sooner a series of experiments are set on foot the better; and, if conducted with skill, and without prejudice, we have no doubt as to the result. Man is a clever creature, and, if in the present advanced state of science he devoted himself to investigating the matter suggested, by a few well-directed experiments, he would soon determine whether or no the views we have expressed have sufficient foundation to warrant the subject being further pursued.

MANUALS OF ELEMENTARY SCIENCE.

"Chemistry." By Albert J. Bernays, Ph.D.
"Geology." By T. G. Bonney, M.A.
"Astronomy." By W. H. M. Christie, M.A. Society for Promoting Christian Knowledge.

These works continue the series of manuals of elementary science now being issued by the Christian Knowledge Society, and they are deserving of much praise. Dr. Bernay's book is not a dry summary of mere technical chemistry, for a great portion of it is devoted to the consideration of the physical properties of matter, and is well calculated to facilitate the teaching of science in our schools.

Mr. Bonney's book on "Geology" is clear in its arrangement, and generally lucid, and on the whole is a useful manual of elementary science.

Mr. Christie, in his "Astronomy," treats an exceedingly difficult subject simply and intelligibly, though he enters on some points not usually touched upon in first books, and discusses questions to some extent open; the explanations offered of points of difficulty are clear, and invite further inquiry.

NEWTON'S ANIMAL PHYSIOLOGY.

"An Introduction to Animal Physiology, with Directions for Practical Work." By E. Tulley Newton, F.G.S., Assistant Naturalist, H.M. Geological Survey. Thomas Murby, Berners-street.

This is one of a series of nice little volumes being brought out by Mr. Murby, entitled "Murby's Science and Art Department," at 1s. each. The work takes up human anatomy and the different functions of the body, and is full of illustrations. It is a curious fact that very few of the ordinary public understand the human system. It is desirable that this knowledge should be more generally possessed. Hence, a volume written like the subject of this review, in a manner to be understood easily and full of interesting details, is welcome. It could also be usefully adopted for educational purposes. *Apropos* to colour blindness, the writer says, inability to perceive certain colours called *colour blindness*, is with some people a permanent infirmity. Instances are occasionally met with of persons quite incapable of perceiving any colour; but perhaps the most common, and, at the same time, most remarkable cases are those of persons who cannot distinguish red from green, to whom red sealing-wax and green leaves appear of similar tint.

The writer says "The heart's action is not under the influence of the will, but is altogether involuntary. At the same time, certain affections of the mind have a considerable effect upon it. Certain emotions, such as those of great joy or sorrow, acting through some of the sets of nerves, very materially interfere with the regular action. Thus it appears that when the sympathetic nerves are unduly excited, the beating is accelerated, inducing what is called palpitation of the heart. If, on the other hand, the pneumo-gastric nerves are affected, the heart's action is retarded, producing faintness, or it may be stopped entirely, and thus cause sudden death."

In regard to the separation of the products of waste from the body, the organs are the lungs, the kidneys, and the skin. The lungs get rid of the greatest proportion of carbonic acid, with a small proportion of water in the form of vapour. The latter may be seen when we breathe in a cold atmosphere, for the vapour as it passes out of the lungs becomes condensed, and is then visible. When a piece of cold glass—a window pane, for example—is breathed on, it becomes moist from the same cause. It is an interesting fact that the presence of carbonic acid in expired air may be shown by causing air from the lungs to pass through a clear watery solution of lime. For much of the matter of the work, the author desires to acknowledge his indebtedness to the writings and lectures of Professor Huxley, and also the works of Carpenter, Foster, Kirke, Kölliker, Klein, Marshall, Quain, Rutherford, Sanderson, &c.

To study reflex action in animals, it is best we are told, to take the frog, and in order to be sure the movements do not proceed from the brain, the head should be cut off!

Great Publishing Undertaking.—The most superbly illustrated work ever yet produced on so comprehensive a scale is now in course of publication, under the title of "Picturesque Europe." It has been for several years in preparation, and will present a complete descriptive and elaborate pictorial illustration of the greater part of the European continent, by bringing together, in a form never before attempted, representations of the numberless objects of Nature and of Art which make Great Britain and the Continent so pre-eminently picturesque. The illustrations will consist of exquisitely-engraved steel plates, and of engravings on wood rivalling the productions on steel. "Picturesque Europe" will be published in monthly parts by Messrs. Cassell, Petter & Galpin.

WAVISH'S PATENTS FOR ECONOMIZING COAL.

The object the inventor had in view when giving his attention to the subject of economizing coal was, if possible, to provide some means by which the heating properties of coal could be burnt in our ordinary stoves and grates instead of, as is generally the case, being driven up the chimney in the form of heavy smoke. He proved that the open bars at the bottom of the grate were the sole cause of our costly mode of burning, for the air passing up between them through the coal formed a direct current up the flue of the chimney, and as the coals expanded with the heat the gas or heating-giving properties of the coal were driven up the chimney instead of being burnt, leaving nothing much better than cinder to burn. He, therefore, after thoroughly investigating the matter and making a variety of experiments perfected his coal-economizer, which not only prevents, by his bottom plate, the extravagant influence of a direct current, but with the aid of his vertical cylinder provides the air so necessary for combustion.

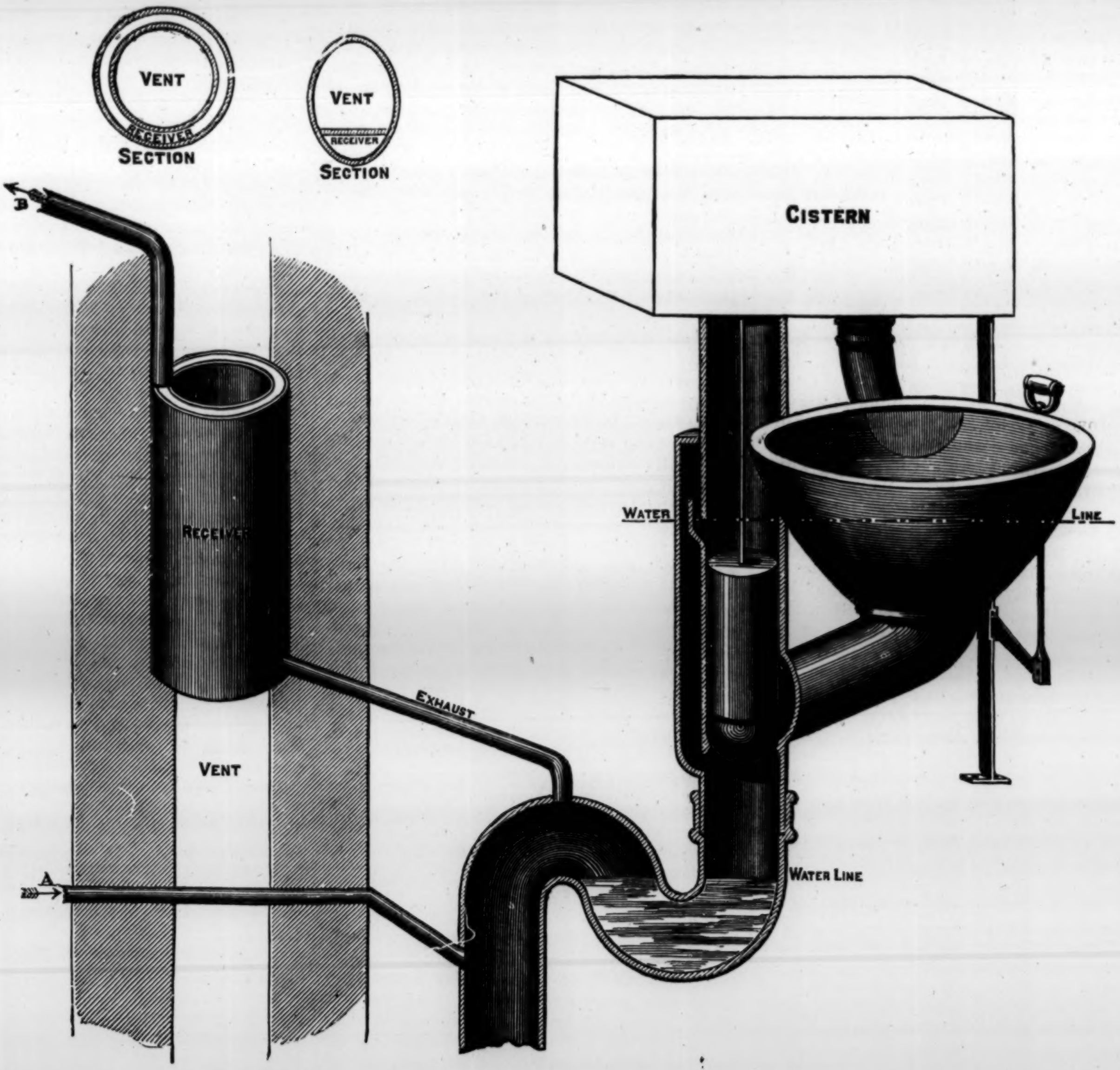
THE COAL ECONOMISER Co
WAVISH'S PATENT.
243 EAST INDIA DOCK Rd
LONDON. E.

It will be seen by the drawing that the plate is supposed to completely cover the bottom part of the grate. All the air is admitted into the cylinder at the bottom, and driven through its perforated circumference into the body of coal in every direction; the upper end of the cylinder is closed, thereby compelling the air to take a lateral course, and driving the heat into the room instead of up the flue of the chimney. The cylinder being in the midst of the body of coal, it soon becomes heated, and the air entering and passing through it is heated, and is in that state burnt with the gas of the coal, whereby perfect combustion is produced.

The patentee of this useful invention is Mr. James Wavish, of East India Dock-road, London, E.

Door and Gate Spring.—L. Gallaher, of Businessburg, U.S., has invented a spring arranged to throw back the gate whenever the latter is opened sufficiently to allow passage through. When the gate is pushed open more widely, devices prevent the action of the spring.

SMITH'S SELF-ACTING W.C. VENTILATOR.



This plan, which has for its object the ventilation of water closets, drains, &c., in a self-acting and efficacious manner.

The diseases engendered by noxious gases arising from drains and water closets are unfortunately so well known as to require little comment, and the utility of this method of obviating the evils complained of will, it is hoped, be apparent.

Traps in water closets, though necessary, too often enhance the evil they are intended to mitigate, for when called into play they liberate the foul gases, which discharge themselves throughout the dwelling, and too often lead to ill-health, if not to pestilence.

The object of the invention is to ventilate the space trapped or closed, and the foul air is carried off by means of a pipe into a receiver situated in the chimney, say of the kitchen, of each house, and forming part of the vent lining.

Other trapped spaces can be treated similarly.

The heated air in the chimney constantly acting on the inner side of the receiver necessarily rarefies the air within, and causes a suction, which is drawn from the space trapped or closed. So as to secure a current, communication at the point A is had with the open air, whilst the air passing in at the foot of the receiver is discharged into the atmosphere at the point B, or carried up to the roof of the house, as the case may be.

Apart from other advantages derived from the use of a Receiver, it may be stated that immediate ventilation is at all times secured, independently of the state of the atmosphere.

The patentee of this useful invention is Thomas Smith, of The Firs, Bannockburn, N.B.

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THE INVENTORS' INSTITUTE,

4, ST. MARTIN'S PLACE, TRAFALGAR SQUARE, LONDON.
ESTABLISHED 1ST MAY, 1862.

Past Presidents:

SIR DAVID BREWSTER, K.H., LL.D., F.R.S., &c., from the establishment of the INVENTORS' INSTITUTE, till his decease, February, 1868. LORD RICHARD GROSVENOR, M.P.

President of Council.
SIR ANTONIO BRADY.

SESSION 1875-76.

MEMBERS' MEETINGS AT 8 P.M.

Thursday, April 13th.—"On the advancement of Industrial Improvement and Technical Education, obtainable by the utilization of the Guilds of London," by Mr. T. Mottershead, when H. Danby Seymour, Esq., late Under Secretary of State for India, is expected to preside.

Thursday, April 27th.—"On some New Improvements in Obtaining and Applying Motive Power," by Mr. R. Bevan, Civil Engineer.

Patent Law Conferences will be held on these evenings if the New Patent Bill render them necessary.

Council Meetings at 7 p.m.

Subscriptions are payable to Mr. G. A. STRETTON, the Receiver, 4, St. Martin's-place, S.W., who is the proper official to give receipts.

F. W. CAMPIN, Sec.

Proceedings of the Institute.

AT the Meeting on 9th March the position of the Inventors' Institute, at the Conference on the subject of the new Patent Bill, called by Sir Antonio Brady for 13th March, was discussed, and after Mr. Allardyce, Mr. Lancaster, and other members had expressed their views on the subject, it was recommended that the Secretary should report the proceedings of that Conference at the next Meeting.

At the Meeting of the Executive Council on 23rd March, Admiral Selwyn, Vice-President of the Institute, in the chair, the suggestions of the Conference held by Sir A. Brady on 13th March (which are published as the principal article in the present number) were reported by the Secretary, and were adopted by the Executive Council as being in the main the same as those of the Institute.

The question of a great meeting at the Society of Arts on the new Patent Bill was considered, but had to stand over till a future meeting.

At the Members' Meeting the same day Admiral Selwyn, V.P., in the chair, Mr. H. A. F. Duckham's paper "On Gas Regulators, specially applicable in Lighting Railway Trains, Trams, as well as other purposes," was read and discussed, the result being that the Invention met with general appreciation. We are, however, compelled to reserve our report of this meeting till our next issue.

Monthly Notices.

The Royal Society gatherings still to come off are—the Reception, May 24th, and the Conversazione, April 5th.

Tram Power-engines in Paris are said to be now running, which obtain their propelling force by means of compressed air, heated as used by being passed through hot water. *Les Annales Industrielles* fully describes the arrangements made by M. Mekarske.

The death of Mr. Evan Leigh, A.I.C.E., A.I.N.A., M.I.M.E., and Member of the Inventors' Institute, has been recently recorded; he was President of the Scientific and Mechanical Society of Manchester, and well-known as an inventor and machine-maker, as also as a defender of the principle of the Patent Laws.

Unbreakable Glass can, according to Herr F. Siemens, the Dresden glass manufacturer, be produced by a process of hardening and tempering glass by pressure in moulds. This process is reported to produce glass as unbreakable as that made by M. Royer de la Bastie's process, and free from some of the objections which appear to the process of tempering in oil.

Raising the Vanguard.—We are informed that the prospects of an attempt being made to recover the Vanguard have so far progressed that the preliminaries of a contract between the Admiralty and a civil engineer have been satisfactorily arranged. Should this contract be finally entered into, it is hoped that operations may be commenced not later than May next.

Natural Ice production has been set on foot on the northern edge of Dartmoor, not far from the South-Western Railway, near Oakhampton. A series of shallow tanks are constructed, and these are charged with water from the granite. In this elevated region, a slight frost produced a good layer of ice; which was collected and stored. This novel process of collecting ice for commercial purposes has been established by Capt. Henderson, of Truro.

The incrustation of steam boilers, so long a source of trouble to steam users, is proposed to be obviated by a preparation of about 16 parts of potato starch mixed with 76 parts of water and 8 parts of soda lye, at 25° Baume. When this forms a jelly, it is well beaten up. Drying slowly in the air, it becomes like strong glue. It has been named Apparatine. Upon being introduced in small quantities into steam boilers, it is said, by a peculiar physical action, to prevent the adhesion of any substance to the iron plates.

Results of Observations in Meteorology and Terrestrial Magnetism, taken at the Melbourne Observatory during the year 1874, under the superintendence of Mr. Robert L. J. Ellery, has recently been published, forming Volume III. of these "Results." From this book we find the maximum temperature of the year was 102·7 in December, and the minimum 29·3 in August; the mean pressure of the air being 29·930 inches, the minimum pressure, 29·118 inches, being in August, the maximum, 30·497 inches, occurring in May. The rain for the year measured 28·10 inches, 6·36 inches falling in March.

University Degrees in Music are the subject of much discussion just now, some people desiring to so far alter the present system of conferring these degrees, as to make it obligatory for those who obtain the degree of Music Doctor to have a more elevated status as regards the general routine of academical studies. Thus, in effect, the degree will not show great eminence in music, but only such eminence as shall be found combined with general book learnedness. In other words, this is one of those attempts at forcing round men into square holes and square men into round holes, which are so dear to the real John Bull.

Dulwich College.—This great educational charity of South London is again receiving the attention of those interested as residents of the locality. An address has been issued by a body of gentlemen, calling themselves the Dulwich Education Committee, in which they deal with the question of the *Upper School*—that is, a school modelled after Eton, Harrow, Charterhouse, Westminster, and other such like establishments, where the sons of rich men are sent to receive benefits that ought to be appropriated to such of the sons of their poorer neighbours as may by intellectual promise be worthy of these benefits. It is certainly a curious feature of the English character, that honourable, honest gentlemen do not scruple to oust the poor from the possession of large proprieties intended for their advantage, and that law and religion aid and abet such abominable spoliation. If the rich want the advantage of public schools, let them multiply such establishments as those of King's College and University College, London, which have nothing eleemosynary about them.

Proceedings of Societies.

ROYAL SOCIETY.

FEBRUARY 10TH.—Dr. Hooker, C.B., President, in the chair.—The Right Hon. B. Disraeli was elected a Fellow.—The following paper was read:—"On Repulsion resulting from Radiation," Part III. and IV., by Mr. W. Crookes.

February 17th.—Dr. Hooker, President, in the chair.—The following papers were read:—"Experimental Contributions to the Theory of Electrolysis," by Mr. A. Tribe: and "Researches upon the Specific Volumes of Liquids. II. On the Specific Volumes of certain similarly constituted Inorganic Chlorides. III. Of Bromine and Iodine Monochloride and of Ethene Bromine and Ethene Chloriodide," by Prof. T. E. Thorpe.

February 24th.—Dr. Hooker, President, in the chair.—The following papers were read:—"On determining the Depth of the Sea without the Use of the Sounding Line; and on an Attraction-Meter," by Mr. C. W. Siemens,—and "On an Instrument for Recording the Direction and Velocity of Currents, and the Temperature of the Water at different Depths in the Ocean," by Mr. J. R. Jones.

March 2nd.—Dr. Hooker, C.E., President, in the chair.—The following papers were read:—"The Organ of Corti in Mammals," by Dr. U. Pritchard,—"Preliminary Note on the Compound Nature of the Line Spectra of Elementary Bodies," by Mr. J. N. Lockyer,—and "On the Influence of Coal Dust in Colliery Explosions," by Mr. W. Galloway.

March 9th.—Dr. Günther, V.P., in the chair.—The following papers were read: "On the Development of the Crustacean Embryo, and the Variations of Form exhibited in the Larvæ of Thirty-eight Genera of Podopthalmia," by Mr. C. Spence Bate,—"On Diurnal Variations of the Disturbances of the Magnetic Declination at Lisbon," by Senhor J. Capello,—and "On a Secular Variation in the Rainfall in Connection with the Secular Variation in the Amount of Sunspots," by Mr. C. Meldrum.

ROYAL INSTITUTION.

MARCH 6TH.—W. Pole, Esq., V.P., in the chair.—Mrs. Frankland, Miss Annie Frances Cole, Miss S. C. Prothero, Miss S. F. Spedding, Sir T. N. Abdy, Bart., Sir J. Hawkshaw, Drs. A. Clark, T. Duka, W. Huggins, F. H. Laking, and H. Maudsley; Messrs. E. Ind, C. Parke, E. M. Prothero, G. T. Robinson, H. Y. Thompson, S. K. Wilson, and A. B. Woodd, were elected Members.

ZOOLOGICAL SOCIETY.

FEBRUARY 15TH.—Prof. Mivart in the chair. The Secretary read a Report on the additions made to the menagerie during January, and called particular attention to a Le Vaillant's Cynictis (*Cynictis penicillata*) presented by Viscount Mandeville; a White-spotted Crake (*Porzana notata*), captured at sea off Cape Santa Maria, Uruguay, and a Panda (*Ælurus fulgens*), purchased. Mr. Sclater exhibited the Parrot called in Tschudi's "Fauna Peruana," *Conurus illigeri*, and observed that it had been wrongly determined. Mr. Sclater was of opinion that the bird belonged to a species hitherto unrecognized, and proposed to call it *Ara Couloni*, after M. Coulon, of Neuchâtel, who had sent the specimen for exhibition. Dr. Cobbold exhibited and remarked on a parasite (Echinorhynchus), obtained from the Tamandua Anteater, which had died in the Society's menagerie. Letters and papers were read by Mr. W. K. Parker, being the second portion of his memoir on Ægithognathous Birds,—from the Rev. O. P. Cambridge, in which he described a new order and some new genera and species of Arachnida from Kerguelen Island, from specimens collected by Mr. Eaton during the transit of Venus Expedition,—by Mr. G. French Angas, on four new species of land shells from Australia and the Solomon Islands, which he severally proposed to name *Helix Moresbyi*, *Helix Ramsdeni*, *Helix beatrix*, and *Helix rhoda*; he also made some remarks on the nomenclature of *Helix angasiana* of Pfeiffer, and *Helix bitœniata*, of Cox,—by Messrs. Sclater and Salvin, on some of the Blue Crows of America, taken from specimens lately examined, and they pointed out certain changes it would be necessary to make in the nomenclature of the group adopted in their "Nomenclator Avium Neotropicalium."

March 7th.—Dr. A. Günther, F.R.S., V.P., in the chair. The Secretary read a report on the additions that had been made to the Society's Menagerie during the month of February, 1876, and called particular attention to an example of the very singular Cervine form lately described by Mr. Swinhoe in the Society's "Proceedings" as *Lophotragus michianus* (P.Z.S. 1874, p. 452). The animal had been procured by Mr. A. Michie, of Shanghai (the discoverer of the species), in the Ningpo district of China. Other interesting acquisitions had been two White-backed Pigeons (*Columba leueonota*), from the Himalayas; a Narrow-barred Pigeon (*Macropygia leptogrammica*), from Celebes; a Bay Bamboo Rat (*Rhizomys badius*), from India, presented by Mr. J. Wood-Mason; and an Anderson's Kaleege (*Euplocamus andersoni*), female, from Burmah, presented by Mr. W. Jamrach. Dr. Gunther exhibited and made remarks on specimens of a minute Australian Mammal (*Antechinus minutissimus*) and of a species of *Palythoa* parasitic on a Mediterranean Sponge. Prof. Garrod read a paper on the Anatomy of the Courlan (*Aramus scolopaceus*) which he regarded as showing in many respects a close affinity to the Cranes (*Grus*). A communication was read from Mr. T. E. Buckley, F.Z.S., containing remarks on the past and present Geographical Distribution of the larger Mammals of South Africa. Dr. Cobbold, F.R.S., read the fourth of his series of Notes on Entozoa. Sir Victor Brooke, Bart., read some Supplementary Remarks on the newly discovered Persian Deer, *Cerus mesopotamicus*, based on additional specimens and information received from Mr. Robertson, H.B.M. Vice Consul at Busreh. A second communication from Sir Victor Brooke contained further observations on Schomburgk's Deer (*Cervus schomburgki*) of Siam.

INSTITUTION OF CIVIL ENGINEERS.

FEBRUARY 15TH.—Mr. G. R. Stephenson, President, in the chair.—The paper read was, "On Estimating the Illuminating Power of Coal Gas," by Mr. W. Sugg.

February 22nd.—Mr. G. R. Stephenson, President, in the chair.—The paper read was "On the Probable Errors of Levelling, with the Rules for the Treatment of Accumulated Errors," by Mr. W. Airy.

February 29th.—Mr. G. R. Stephenson, President, in the chair.—The paper read was, "On the Floods in England and Wales during 1875, and on Water Economy," by Mr. G. J. Symons.

GEOLOGICAL SOCIETY.

FEBRUARY 2ND.—J. Evans, Esq., President, in the chair.—Messrs. E. R. Alston, D. C. Glen, T.V. Holmes, W. G. M'Murtrie, C. B. Renshaw, R. D. Turner, and G. F. Whidbourne, were elected Fellows.—The following communications were read: "Evidence ofa carnivorous reptile (*Cynodrakon major*, Ow,) about the size of a Lion, with Remarks thereon," by Prof. Owen. "On the Occurrence of the Genus Astrocrinities (Austin) in the Scotch Carboniferous Limestone Series, with the Description of a New species (*A.? Benniei*), and Remarks on the Genus," by Mr. R. Etheridge, jun.,—and "On the Genus Merycochœrus (Family Oreodontidæ), with Descriptions of two new Species," by Mr. G. T. Bettany.

February 18th.—Annual General Meeting.—J. Evans, Esq., Presiuent, in the chair.—The Secretary read the Reports of the Council and of the Library and Museum Committee for the year 1875. The Wollaston Gold Medal was presented to Prof. Huxley,—the balance of the proceeds of the Wollaston Donation Fund to Mr. J. Gwyn Jeffreys, for transmission to Prof. Giuseppe Seguenza,—the Murchison Medal to Prof. Ramsay, for transmission to Mr. A. R. C. Selwyn,—the Murchison Geological Fund to Prof. Ramsay, for transmission to Mr. J. Croll,—and to Prof. Morris, the first Lyell Medal and the entire proceeds of the Fund. The President read his Anniversary Address. The following gentlemen were elected the Council and Officers for the ensuing year:—President, Prof. P. M. Duncan; Vice-Presidents, Sir P. de M. Grey Egerton, R. A. C. Godwin-Austen, J. W. Hulke, Esq., and Prof. A. C. Ramsay; Secretaries, D. Forbes and the Rev. T. Wiltshire; Foreign Secretary, W ington W. Smyth; Treasurer, Dr. J. Gwyn Jeffreys; Council, H. Bauerman, Rev. T. G. Bonney, W. Carruthers, F. Drew, Prof. P. M. Duncan, Sir P. de M. Grey Egerton, R. Etheridge, J. Evans, D. Forbes, R. A. C. Godwin-Austen, H. Hicks, W. Hulke, Dr. Gwyn Jeffreys, Prof. T. R. Jones, J. W. Judd, Prof. J. Morris, Prof. A. C. Ramsay, S. Sharp, W. W. Smyth, Admiral T. A. B. Spratt, W. Whitaker, Rev. T. Wiltshire, and H. Woodward.

February 23rd.—Prof. P. M. Duncan, President, in the chair.—The Rev. D. Charles, Dr. E. H. W. Swete, Messrs. T. M. Heaphy, W. Smethurst, and J. T. Young, were elected Fellows, and Prof. J. Gosselet, of Lille, a Foreign Correspondent of the Society. The following communications were read:—"On the Greenstones of Western Cornwall," by Mr. J. A. Phillips,—and "On Columnar, Fissile, and Spheroidal Structure," by the Rev. T. G. Bonney.

March 8th.—Prof. P. M. Duncan, President, in the chair.—Messrs. W. J. C. Crawley, J. Thompson, and W. Walker were elected Fellows. The following communications were read:—"On the Influence of various Substances in accelerating the Precipitation of Clay suspended in Water," by Mr. W. Ramsay,—"On some Fossilliferous Cambrian Shales near Carnarvon," by Mr. J. E. Marr, with an Appendix by Mr. H. Hicks,—"On the Occurrence of the Rhætic Beds near Leicester," by Mr. W. J. Harrison,—and "On Hæmatite in the Silurians," by Mr. J. D. Kendall.

MICROSCOPICAL SOCIETY.

MARCH 1ST.—H. C. Sorby, Esq., President, in the chair.—Dr. T. Partridge was elected a Fellow.—A paper was read by Mr. Hartley, descriptive of certain observations and experiments on the fluids contained in quartz cavities, and which appeared to be liquid carbonic acid, mixed in most cases with water. The subject was illustrated by drawings, and by specimens and experimental demonstrations under the micro scope. A paper was read by Mr. F. Rutley, "On the Structure of Certain Rocks—Obsidian and Leucite—and on the Spheroidal Structure observed in the Perlites." The subject was freely illustrated by diagrams and specimens exhibited in the room. A paper, by the Rev. W. H. Dallinger, "On a New Arrangement for Illuminating and Centering for High Powers," was taken as read, it being understood that, though of great interest, it could not readily be explained without the numerous illustrations by which it was accompanied.

ASTRONOMICAL SOCIETY.

FEBRUARY 11TH.—Annual Meeting.—Prof. Adams, President, in the chair.—Amongst the lives of deceased Fellows, given in the Annual Report, were those of Mr. Carrington, Prof. Selwyn, Mr. Vignoles, and Sir E. Ryan; and amongst the deceased Associates were Prof. Argelander, M. d'Arrest, and M. Mathieu. Mr. Carrington, has left the Society a legacy of £2,000. He for many years served as Secretary, and during that period published two important works—the one upon Sun Spots, and the other known as the "Red-hill Catalogue of Circum-polar Stars." Mr. Carrington was the first to show the existence of the great drifts in the solar photosphere, and to determine accurately the position of the sun's axis and the rotation-periods of the various heliographic latitudes. After reading the Report of the Society, the President delivered his address upon the presentation of the Gold Medal to M. Leverrier, for his investigations with reference to the perturbations of the outer planets. The Astronomer-Royal referred to Prof. Adams's address as one of a most exhaustive character, such as could only have been delivered by the Professor. The Meeting proceeded to the ballot for officers and Council for the ensuing year, and the following gentlemen were declared to be elected:—President, Dr. Huggins; Vice-Presidents, Prof. J. C. Adams, Sir G. B. Airy, Mr. De La Rue, and Mr. Lassell; Treasurer, Mr. Whitbread; Secretaries, Mr. Dunkin and Mr. Ranyard; Foreign Secretary, Lord Lindsay; Council, Capt. Abney, Mr. Brett, Prof. Cayley, Mr. Christie, Mr. Glaisher, Mr. Knobel, Mr. Knott, Capt. Noble, Rev. S. J. Perry, Prof. Pritchard, the Earl of Rosse, and Capt. Tupman.

March 10th.—Dr. Huggins, President, in the chair.—Since the last meeting the Society has received a valuable present of rare books from the library of the late Mr. Sheepshanks. Lord Lindsay has also presented the Society with the sun-spot manuscripts and observations of the late Mr. Carrington, a very valuable series, which has been made use of in determining the present received values of the elements of the position of the Sun's axis and the drifts of the solar photosphere. —A paper, by Dr. R. Piggott, was read, "On a Star-illuminated Transit Eye-piece." A sheet of glass, on which a thin film of silver is deposited, is placed in the focus of the eye lens, transparent lines are drawn in this film instead of wires, and as the star passes across the lines it is seen to flash out brightly. The film of silver is made sufficiently thin to permit of the star being seen when it is between the lines; but it appears that the lines themselves are only visible (except in the case of very large stars) when the star disc is in transit across the line.—Capt. Abney read a paper "On Photographing the least Refracted End of the Solar Spectrum." He said that within the last two years many attempts had been made to photograph the ultra red rays. Dr. Vogel in 1874, and, more recently, Capt. Waterhouse, had made use of aniline dyes in the collodion; they stated that with a red dye the collodion was found to be most sensitive to the red end of the spectrum. He had repeated these experiments, and had obtained only partial success; he had, however, from considering the chemistry of the question rather than the physical explanation which had been given, and which he believed to be a mistake, been led to try other experiments as to mixing gum resins with the collodion, and had obtained a compound which was very sensitive to the long wave lengths, so that he had been able to obtain distinct traces of the spectrum beyond A. He hoped to continue his experiments, and would give a fuller account of them to the Society at a later meeting.—Two papers were read, "On the Proper Motion of the Star B.A.C. 793." It appeared, from the remarks of the Astronomer-Royal and Mr. Dunkin, that there is no sufficient evidence to prove that its proper motion has changed during the present century.—Capt. Noble drew attention to a paper by M. Normand, "On the Occultation of Stars by the Planets, as a Means of Determining the Solar Parallax." He wished the owners of large telescopes to determine with what degree of accuracy they could observe the occultation of minute stars at the limb of Mars.

GEOGRAPHICAL SOCIETY.

FEBRUARY 14TH.—Major-General Sir H. C. Rawlinson, President, in the chair.—The following gentlemen were elected Fellows: Commander A. T. Brooke, Col. Malcolm Green, Col. W. T. L. Patterson, Rev. T. E. Brown, Rev. J. Jeakes, Messrs. R. H. Few, C. G. S. Foljambe, G. Grove, J. D. Lever, A. D. Marzetti, G. G. Newman, G. Shaw, F. C. Taylor, C. J. Wainwright, and H. Woods. The paper read was "Diary of the late Mr. Margary from Hankow to Ta-li-fu."

February 28th.—Major-General Sir H. C. Rawlinson, President, in the chair.—The following gentlemen were elected Fellows: Col. E. Cave, Lieut.-Col. Ackroyd, Lieut.-Col. A. D. Vanrenen, Major H. Thompson, Commander A. Eaton, Capt. Hon. G. Napier, Nav.-Lieut. J. E. Coghlan, Dr. W. Carr, Messrs. I. Abrahams, J. Buckley, J. L. Clifford, A. Ebden, S. G. Gwynne, A. T. Hawkins, A. W. Hughes, T. Routledge, J. Johnson, M. Johnson, H. Jupe, H. T. W. May. The papers read were: "On the Shueli Valley of Burma," by Mr. N. Elias, —and "Afghan Geography," by Mr. C. R. Markham.

March 13th.—Sir R. Alcock, V.P., in the chair.—The following gentlemen were elected ed Fellows: The Hon. G. Denman, the Hon. C. H. Stewart Erskine, Major-General J. Black, Major W. K. Elles, Major O. B. Feilden, Major H. Wood, Messrs. R. Arrowsmith, J. Biggs, G. C. Boor, A. H. Cocks, J. Coles, L. Floersheim, E. L. Hall, F. C. Jarvis, R. Petch, H. Rae, J. Williams, and T. B. Winser.—The papers read were, "Ascent of the Fly River, New Guinea," by the Rev. S. M'Farlane,—and "Excursions into the Interior of New Guinea from Port Moresby," by Mr. O. C. Stone.

PHYSICAL SOCIETY.

FEBRUARY 12TH.—Annual General Meeting. —Prof. Gladstone, President, in the chair. —The following were elected Members:—Mr. W. R. Hodgkinson and Mr. H. M. Hastings. The President read the Report of the Council, of which the following is an abstract:—The Council points with satisfaction to the activity with which the work of the Society has been carried on during the year, as is shown by the number of papers read; and special reference is made to the lectures which were delivered by M. Cornu, of Paris, and Mr. J. N. Lockyer. The election of many distinguished physicists during the past year has given the Council much satisfaction, as it affords undoubted evidence of the progress of the Society and of the position it has now attained. The Society has to regret the loss of two Members, Mr. Becker, who died on the 3rd of April, 1875, in his fifty-fourth year; and Mr. Waugh, who died on the 12th of October, in his fortieth. The Society has already published a work, by Prof. Everett, "On the Centimètre - Gramme - Second System of Units," and the Council is now in communication with the family of the late Sir C. Wheatstone, with a view to the publication of his papers. Attention is drawn to the benefit which the Society derives from the use of the lecture-room, &c., placed at its service by the Lords of the Committee of Council on Education. It has been considered desirable to arrange that the Council may grant admission to all meetings of a session to approved persons who are not members of the Society. In concluding, the Council records its thanks for the services which Dr. Guthrie has rendered in his office of Demonstrator, an office which was formerly an important one in the Royal Society: and the Council believes that much might be gained if arrangements could be made for reproducing before this Society the experiments described in original papers which appear from time to time in this country and abroad. Several alterations in the bye-laws were discussed and adopted, and the following Officers and Council were elected for the ensuing year:—President, Prof. G. C. Foster; Vice-Presidents, Prof. W. G. Adams and Dr. W. Spottiswoode; Secretaries, A. W. Reinold and W. C. Roberts; Treasurer, Dr. E. Atkinson; Demonstrator, Dr. F. Guthrie.

February 26th.—Prof. G. C. Foster, President, in the chair.—The following candidates were elected Members:—The Rev. R. Abbay, and Mr. W. Bottomley, sen. Mr. A. Haddon exhibited and described a form of tangent galvanometer, so arranged that, by the aid of an electric lamp, an image of the needle can be projected on the screen, and its deflections thus made evident to large audiences. Mr. O. J. Lodge described some investigations on which he has recently been engaged in reference to the flow of electricity in plane bounded surfaces, in continuation of a paper read before the Society in the early part of last year, by Prof. G. C. Foster and himself. After some introductory considerations, he pointed out that all the conditions of the flow of electricity are known for any number of poles in an unlimited sheet. The problem then consists in reducing cases of poles in unbounded planes to corresponding cases in the unlimited plane, so that the flow conditions on the bounding line may be the same in both cases. The determination of these data, however, for limited planes of certain forms presents considerable difficulty. In studying questions of this nature there are two kinds of lines which must be considered. These are "equipotential lines" *along* which no electricity passes, and "lines of flow" *across* which no electricity passes. The boundary of any conducting surface will, of course, always be a line of flow, and, in a bad conductor, we can form an equipotential line by laying a band of copper in the required direction. If, therefore, in studying a surface of limited extent, in contact with an electrode, we can find a point, or points, outside the surface such that, if they be made electrodes, the boundary line of the surface becomes a line of flow, we are at liberty to treat the surface as part of an infinite plane, and all the circumstances are therefore known. To take the simplest case, a straight line in an infinite surface will be a line of flow if equal sources be placed in pairs on opposite sides of the line, so that one is the virtual image of the other; but, if the components of each pair are of opposite sign, it becomes an equipotential line. To make a circle of radius (r) an equipotential circle, we require a source A within, and a sink B without such that $CA \cdot CB = r^2$. To make it a line of flow we require two sources such that $CA \cdot CB = r^2$, and an equal sink at C, the centre of the circle. The cases of an infinitely long straight strip, and of a surface bounded by two straight lines inclined at an angle Θ, were then referred to, and Mr. Lodge showed that the first requires an infinite number of external sources arranged on a straight line, and the second an infinite number on a circle, except when Θ is a submultiple of Π, the number then becoming finite. Diagrams of the images for certain cases of triangles and squares were also shown. The dimensions of the electrodes in contact with conducting surfaces are not matters of indifference. In a plane bounded by straight lines the electrodes within and without the boundary are of equal size; but when the boundary is a circle the areas of electrodes vary as the squares of their distances from the centre. It was then pointed out that not only the poles may be reflected in this way, but also every point in the sheet; and if the lines of flow or of potential are drawn inside a given circle for any arrangement of poles, the lines outside can be immediately obtained from them by inversion with regard to the centre of the circle by means of a Peaucellier cell. The author then described the manner in which the principle of Wheatstone's Bridge can be employed for tracing out lines of equal potential. If A and B be a source and sink on a conducting ring, and P any point on the ring between A and B, and Q any point between B and A, then P and Q are of equal potential, whenever $\frac{PA}{PB} = \frac{QA}{QB}$. If now the wire under the point P be flattened out into a surface, the above expression holds good for a certain line on that surface, which is therefore an equipotential line. Similarly by flattening out the wire under the point A, the line for which the expression then holds good is a line of flow for a certain distribution of poles. At this point, the reading of the paper was adjourned to the next meeting of the Society.

March 11th.—Prof. G. C. Foster, President, in the chair.—The following candidates were elected Members:—Messrs. W. H. Coffin, T. D. Humpidge, and Rev. G. H. Hopkins.—Prof. W. G. Adams gave an account of some researches on which he has been engaged in connection with the influence of light and heat on the electric conductivity of selenium, and exhibited numerous experiments in illustration. The subject has also been studied by Lieut. Sale and Dr. W. Siemens, of Berlin, and, as a general result, it is found that, after it has been kept in the dark, the resistance of the metal is diminished by exposure to light. The effect, however, both of heat and light, is different in the several states through which the metal passes. In studying the effect of light, the metal, which had been heated to 140° C., was exposed to a candle at distances of 1, ½, and ¼ mètre. The initial resistance being 115,500 ohms, the readings in these three cases were 112,000, 108,700, and 101,500. Deducting each from the initial number, we have 3,500, 6,800, and 14,000 ohms, as the changes of resistance due to exposure at these distances. Hence the effect of light varies inversely as the distance, or, what amounts to the same thing, directly as the square root of the illuminating power. These considerations have led Prof. Adams to suggest the use of selenium for comparing the illuminating powers of different sources of light, and he exhibited the arrangement which he proposes to use for this purpose. The action of light of different degrees of refrangibility was then exhibited by allowing the light from several parts of a spectrum of the electric lamp, produced by a bisulphide of carbon prism, to fall on the metal, the remainder being cut off by means of a screen in which there was a narrow slit. The violet light gave a deflection of about 2 divisions on the screen, the greenish yellow 4, the orange red 5½, and the deep red 9 divisions. This fact may be strikingly shown by exposing selenium, through which a current is passing, to the flame of a Dunsen burner, first when in its ordinary condition, and afterwards with the air-openings at the base closed. It was shown that, whereas in the first case the effect produced was equivalent to 3 divisions of the scale, in the latter case one-tenth of the current produced by the exposure deflects the needle to the ends of the scale. Prof. Adams, in replying to the various questions, mentioned that he has examined the effect of light deprived of the ultra-chemical rays, but the change seemed to have no effect. He has also made experiments on the influence of light after passing through classes of different colours, but there is considerable difficulty in ascertaining how much of the effect is due to the degree of refrangibility, and how much to the change in the intensity of the light. The effect is most intense in the greenish yellow and the deep red, and it is worthy of remark that at these two points groups of bands are observed in the spectrum of the metal. Prof. J. Stoney explained the theory which he has suggested in explanation of the phenomena observed in the radiometers of Mr. Crooke's which has been published in the *Philosophical Magazine* for the current month. The theory rests on the supposition that there is an excessively small trace of residual gas in the sphere in which the moving discs are enclosed. When the apparatus is exposed to heat, the blackened side of the disc is slightly warmed, and this warms a layer of air in contact with it. At the ordinary atmospheric pressure, Prof. Stoney assumes the layer so warmed to have the thickness of a sheet of paper, when the temperature of the disc is 20° C. above that of the surrounding air, and on such a supposition we may calculate it for any other pressure and temperature. Thus, if the disc be raised 1-10th° C. above the surrounding air, and the exhustion carried to the 1-10,000th of an atmosphere, the layer will have a thickness of more than a décimètre, and the effect of the air will then be peculiar. There will be a procession of warm molecules towards the glass, where they will be cooled down, and form a number of cold, slow-moving molecules, which will go back to the disc and beyond it. So long as these processions go on, the slow-moving molecules which reach the front of the disc are thrown off more vigorously than from the back. Prof. Stoney considers the pressure thus produced to be that measured by Mr. Crookes. With a pressure of the gas of 1-10,000th of an atmosphere, an elevation of temperature of 1-10th° C. will produce the force actually observed. It was pointed out that on this theory the action may be considered as closely resembling electricity, and Mr. Crookes has shown that the glass envelope is often itself slightly electrified. Mr. Crookes considered that 1-10th° C., the temperature assumed by Prof. Stoney, was far in excess of what actually is required to produce the observed effects, for the discs are strongly moved by cold heat falling on them, for example, when placed in front of a window or close to a wall. With discs of platinum there is attraction throughout all the stages in the exhaustion from 1 m. m. of mercury until a fairly perfect vacuum is attained. If, however, the exhaustion is continued, we reach a neutral point, beyond which there is strong repulsion, and this is strongest in the very best vacua, which will not conduct an induced spark. Prof. Stoney would seem to show that the action should vary with the size of the apparatus, but this is not found to be the case. Mr. Crookes inquired whether the extremely rapid rotation of the discs would not interfere with the "processions" of molecules. Prof. Stoney pointed out the enormous velocity of the molecular motions in proof that the rotation of the discs would be without influence. The fact that similar velocities of rotation are observed in radiometers of different diameters only shows that they are all within the limits of the thickness of the layer which he considers to produce the effects observed.

CHEMICAL SOCIETY.

February 17th.—Prof. Abel, President, in the chair.—The President announced that Mr. J. Duncan had presented the society with a marble bust of Dr. Hofmann. Prof. Frankland delivered his lecture "On some Points in the Analysis of Potable Waters." After alluding to the incalculable importance of water-analysis in a sanitary point of view, not only in showing the *present* organic impurity, but also as giving evidence of *past* pollution, he proceeded to describe the most recent improvements in the combustion method of determining the amount of carbon and nitrogen in water residues. A full discussion of the variation in purity of the water supplied, during the past eight years, by the various London companies then followed, illustrated by diagrams, and the lecturer concluded by pointing out some of the objections to the other well-known processes employed for water-analysis. The discussion was adjourned.

March 2nd.—Prof. Abel, President, in the chair.—The meeting was entirely occupied with the discussion of the various points in connection with water-analysis, raised by Dr. Frankland's lecture delivered at the previous meeting. The debate turned chiefly on the respective merits of Messrs. Frankland and Armstrong's "Combustion Method" and of the "Albumenoid Ammonia Process" for determining the amount of impurity in potable waters.

MATHEMATICAL SOCIETY.

February 10th.—Prof. H. J. S. Smith, President, in the chair.—Messrs. A. Cockshot and R. T. Wright were proposed for election.—The following communications were read: "Loci connected with the Rectangular Hyperbola, being Inverses with respect to its Centre and Vertices," by Prof. Wolstenholme,—"On Determinants of Alternate Numbers," by Mr. W. Spottiswoode,—"On the Transformation of Gauss's Hypergeometric Series under a Continued Fraction," by Mr. T. Muir,—"On the Partition of Geometrical Curves," by the President,—and "On the Sum of the Products of *n* different terms of a Series," by Mr. J. Hammond,—"On Pendular Motion," by Prof. Clifford.—The Chairman read part of a fly-sheet, "On the Pan-imaginary Theory," forwarded by the Comte Léopold Hugo, member of the Paris Mathematical Society, in which space is divided into *e* dimensions.

March 10th.—W. Spottiswoode, Esq., V.P., in the chair.—Messrs. A. Cocksholt and R. T. Wright were elected Members, and Messrs. E. B. Elliott, C. M. Leudesdorf, and J. W. Russell were admitted into the Society. The following communications were made: "On the Bicursal sextic and the Problem of Three-Bar Motion," by Prof. Cayley,—and "On the Classification of Geometric Algebras," by Prof. Clifford.

NUMISMATIC SOCIETY.

February 17th.—J. Evans, Esq., President, in the chair. The Rev. A. Pownall exhibited a pattern half-groat of Charles the First, incorrectly described and engraved by Ruding, vol. ii. p. 327, and vol. iii. pl. xxii. 16; a Scottish shilling of James the First, with the "Thistle" mint-mark, found at Wenlock in 1875; a coin of Alexander the Third of Scotland, found at Medbourne, in the county of Leicester, with the usual obverse, and ESCOSSIE REX on the reverse. The Rev. Dr. Neligan sent for exhibition a rubbing from a gold coin of Jean de la Vallete, Grand Master of the Order of St. John of Jerusalem, A.D. 1557-1568. Mr. Evans exhibited two unpublished seventeenth-century tokens, respectively, of Hughenden and Beaconsfield, bearing the names of Francis Barnaby and John Foscet. Mr. P. Gardner read the first portion of a paper, "On the Coins of the Greek Cities in Sicily, exclusive of Syracuse," the object of the essay being to furnish a canon for the determination of the periods at which the various coins of Sicily were issued. In his preliminary remarks, Mr. Gardner said that he would approach his subject from three points of view, first, from the stand-point of history, second, from that of the development of art, and, third, from that of epigraphy. The first only of these three subjects was discussed at this meeting, the two latter being reserved for the next. Mr. Gardner then proceeded to describe all the Greek coins of Sicily, of which the dates can be accurately determined, and which consequently afford data for the more definite attribution of the rest, commencing with the famous "Demaretia' struck after the battle of Himera, in B.C. 480, and concluding with the Roman coins issued in Sicily, in the time of Augustus.

SOCIETY OF BIBLICAL ARCHÆOLOGY.

MARCH 7TH.—Dr. S. Birch, President, in the chair.—The following papers were read: "On the Mammalia of the Assyrian Monuments, Part I. Domestic Mammals," by the Rev. W. Houghton,—and "The Fight between Bel and the Dragon, and the Flaming Sword which Turned every way (Gen. iii. 24)," translated from a Chaldean tablet by H. Fox Talbot.

PSYCHOLOGICAL SOCIETY.

FEBRUARY 17TH.—Mr. Serjeant Cox, President, in the chair.—With reference to the report of the statement of Stokes, relative to his discovery of the Wainwright murder, the President said that the supposed voice was subjective, not objective. Doubtless there was something in the shape or the smell of the parcel that unconsciously affected his mind, and awakened a desire to know what it contained, and this prompted the imaginary voice, "Open it." If not this, it was one of those supersensuous mental impressions not uncommon. Certainly it was not supernatural.—Mr. G. M. Tagore read a paper, "On the Primitive Psychology of the Aryans," which was followed by a discussion. He contended that the belief in the existence of soul had been an inheritance from the primitive race.

February 24th.—Annual Meeting.—The Council were re-elected; and the following gentlemen were elected Officers: Mr Serjeant Cox, President; Sir J. H. Maxwell, Bart., W. Crookes, and Dr. G. Harris, Vice-Presidents; Mr. F. K. Munton, Treasurer and Honorary Secretary.

March 2nd.—Mr. Serjeant Cox, President, in the chair.—Several communications were read of psychological facts and phenomena. —A paper, "On Mind in Man and Animals," by Mr. C. S. Wake, sought to trace the evolution of the mental faculties and the distinction between instinct and reason. The discussion was sustained by Mr. G. M. Tagore, Mr. G. Harris, Mr. Wedgwood, Mr. Kent, the Rev. W. S. Moses, the President, Mr. J. Powell, and others. It was announced that the Experimental Investigation Committee had been formed, and would commence its labours immediately.

ENTOMOLOGICAL SOCIETY.

FEBRUARY 2ND.—Sir S. S. Saunders, V.P., in the chair.—Mr. M'Lachlan directed attention to an article, by M. F. Baudi, in the *Petites Nouvelles Entomologiques* respecting the habits of *Cychrus cylindricollis*, which he had taken on Monte-Codeno, feeding on the body of a snail (*Helix frigida*), into the shell of which the beetle was enabled to enter by means of its long prothorax. Some interesting remarks were made by Mr. Bates and others on the peculiar structure and habits of the insect, which appeared to have been found only on a very sterile portion of the plateau of the mountain, and in no other part. A paper was communicated by Dr. D. Sharp, entitled "Contributions to an Insect Fauna of the Amazon Valley—(Staphylinidæ)." Of this important group of Coleoptera, 487 species were enumerated as inhabiting the valley, of which 463 were described as new; suggesting forcibly how little is really known of the Staphylinidæ of Tropical America. Dr. Sharp stated that he had devised a method of covering and hermetically sealing the type specimens which, he believed, would accomplish their almost complete preservation, and that he hoped soon to be able to publish a description of the method. The author concluded with remarking on the great importance of certain sexual characters in distinguishing the species.

March 1st.—Prof. Westwood in the chair. —Dr. G. Kraatz, and Mr. C. Müller, both of Berlin, were elected Foreign Members; and Mr. O. E. Janson was elected an Ordinary Member.—Mr. J. Weir exhibited two grasshoppers in an undeveloped state, taken by himself in the Rhone Valley, in copulâ, a peculiarity which had frequently been observed among the Hemiptera. He also exhibited a remarkable moth from Madagascar, belonging to the Uraniidæ, bearing a very striking resemblance to a Papilio, except that it had the antennæ of a moth, and the hind wings were destitute of tails.—Mr. E. Y. Western exhibited coleoptera taken chiefly in Switzerland.—Mr. W. A. Lewis exhibited a specimen of *Argynnis Dia*, taken in England by Mr. W. A. Smith.—Mr. Smith stated, in answer to various inquiries by the President and others, that he had taken the specimen in 1872, in Worcester Park, and distinctly remembered the capture, as it was the first fritillary he had ever had in his possession; and also that it had never been out of his possession since he had captured it.—Mr. Bates read a letter from Mr. Trovey Blackmore to Mr. M'Lachlan, stating that he was much interested in observing a notice in the *Proceedings* of the Society respecting the habits of *Cychrus cylindricollis*, reported by M. Baudi to feed on snails. He had already called attention (in the *Entomologist's Monthly Magazine*, xi. 214) to the fact that the *Carabus stenocephalus*, Fairm., fed on snails, which in Morocco was so very abundant as to form a marked feature in the landscape, by covering the bushes so thickly as to resemble, at a distance, clusters of blossom. He had captured in all eighteen specimens of this rare Carabus, and of these fifteen were obtained either feeding on snails, or climbing up bushes of Retama, which were covered with snails, especially with *Helix planata*. The Carabus having an unusually long head and the prothorax being narrowed anteriorly, enabled it to thrust its head and prothorax a considerable distance into the shell in search of its food. Mr. Blackmore referred to several other North African species of Carabi which he thought might be found to have similar habits to those of *C. stenocephalus*.—The President read a paper, entitled "A Dipterological Note from Pompeii," containing remarks on the habits of the genus Bombylius.—The President also presented descriptions of some new species of Tipulidæ, in the British Museum, accompanied by drawings, showing them to be furnished with hind legs of unusual length.—Mr. J. Scott contributed a monograph of the British species belonging to the *Hemiptera-Homoptera* (Family Psyladæ), together with a description of a genus which might be expected to occur in Britain.

METEOROLOGICAL SOCIETY.

FEBRUARY 16TH.—Mr. H. S. Eaton, President, in the chair.—Messrs. F. C. Capel, Z. Humphreys, E. Mawley, W. H. Watson, Rev. G. H. Mullins, and Dr. C. T. Williams were elected Fellows.—The following papers were read:—"On an Improvement in Aneroid Barometers," by the Hon R. Abercromby. The improvement consists in jewelling the ends of the arbor of the index hand like the ordinary pivots of a watch, and making the hand work under the cap, instead of in the usual manner. The advantages gained are (1) increased sensitiveness, (2) increased definiteness of the indications, and (3) diminished influence of weather on the bearings. "Meteorology in India in relation to Cholera," by Col. J. Puckle. The author, in this paper, lays before the society some facts in connection with several serious outbreaks of cholera in different parts of the Mysore country during the last fifteen years, and draws attention to the similarity of the abnormal meteorological conditions that existed on each occasion. Except in a few of the largest towns in India there are no sewers and no sewer gas proper. Even in these exceptional towns the drainage is incomplete. The general sanitary arrangements are of the most primitive character. In the rural districts the inhabitants adhere to the Mosaic law, in so far that they go forth to the fields; but the rest of the work is left to the drying action of the sun, to the kites and other carrion birds, and, *horribile dictu*, to the pigs and poultry that afterwards are doubtless turned into food. In this way it is not difficult to conceive that sewage of the direst and most unadulterated kind may possibly be taken into the system through poisoned meat, or during rainfall it may find its way to open reservoirs or wells; from which two sources the inhabitants depend for their water-supply. At other times, during the hot, dry weather, when no rain falls, malaria may arise and be distributed through the agency of the atmosphere. Notwithstanding all that has been said and done, the clue to the mystery of the origin of the disease remains undiscovered. It is the same with the treatment. Remedies that at one time appeared to be most effectual have, at another, most signally failed. Even during the same attack, the same remedy that cured one person would fail in another, even where the same conditions apparently existed. Failure of the usual rainfall at the proper time, and abnormally high and harsh temperature, have been concurrent with several attacks in Mysore and Southern India. At such times the open reservoirs or lakes and wells are much below the usual spring level, and any contamination received at such a time is obviously much less diluted, and more harmful. The author then gives an account of several attacks that have come under his own personal knowledge, and show beyond doubt that the disease has been arrested by change of air and surroundings, and that ordinary sanitary practice has prevented a possible outbreak. After referring to the recent outbreaks at Bangalore and Madras, the author says that everywhere the same story is told of the occurrence of cholera coincident with long absence of rain and a temperature abnormally high. "On Sixteen Months' Rain at Bristol," by Mr. W. F. Denning.

LINNEAN SOCIETY.

FEBRUARY 17TH.—J. Gwyn Jeffreys, V.P., in the chair. Four new Fellows were elected. Sir J. Lubbock, Bart., read a paper, "Additional Observations on Ants," which contained much instructive matter concerning contested points bearing relation to their supposed wisdom, powers of intelligent communication, affections, and to their senses. Dr. Cobbold gave a notice of and exhibited several specimens of the new human fluke discovered by Prof. J. F. P. McConnell, of Calcutta. This parasite was first described by Dr. McConnell in the *Lancet* of the 21st of August, 1875. Prof. Leuckart, of Leipzig, unaware that the species had been already named *Distoma sinense*, proposed the name *D. spatulatum*, which thus sinks into a synonym. Dr. Cobbold pointed out how the transparency of the specimens permitted all the internal organs to be well seen, and thus their structure could not readily be confounded with that of any known species. The Entozoa found by Dr. Kerr, of Canton, and described by Prof. Leidy, did not belong to the above species, but to the great human fluke (*Distoma crassum*) discovered by Prof. Busk. Details of this last-named parasite will shortly be published in the Society's *Journal*. A paper was read by Dr. J. Anderson, "On the Cloacal Bladders, and on the Peritoneal Canals in Chelonia." The former seem first to have been described by Bojanus in *Emys Europæa*, but since have received little attention. Dr. Anderson has ascertained their presence in a number of Asiatic genera and species, though they do not occur in others, Testudo, Trionyx, &c., to wit. He suggests that these organs may be related to the habits of life, as it appears they are confined to those animals that are semi-terrestial and semi-aquatic in habit; the true land and essentially water-living Chelonians, being unprovided with them. Although some Chelonia draw in and eject water from the cloaca, the precise function of the pouches in question has not been clearly determined. The peritoneal canals have received elucidation from Cuvier, Is. Geoffroy, and Martin; but as to their relations, function, and homology, Dr. Anderson is at variance with those *savans*. Basing his views on experimental injection and otherwise, he regards them as not connected with the generative functions, but rather agrees with Dumeril and Bibron as to their being accessory and subordinate to transpiration. He believes they have a distinct origin from the Mullerian ducts, and are homologous with the abdominal pore of Selachians and Ganoids.

March 2nd.—Prof. G. J. Allman, President, in the chair. Prior to the ordinary business, the Chairman, in graceful terms, alluded to the loss the Society had sustained in the death of two of its old and respected Fellows. Mr. J. J. Bennett for twenty years held the office of Secretary, afterwards being appointed to the British Museum. His "Plantæ Javanicæ" marks an era in Geographical Botany. Officially, he worked wisely and energetically for the interests of the Society, and leaves behind him a name alike known in the field of science and of humanity. M. Adolphe T. Brongniart, almost the oldest foreign member, as author of the great work, 'Végétaux Fossiles,' editor of the Botanical department *Annales de Science*, besides a host of memoirs and papers scattered through various journals, stands out one of the great Botanical lights of our age. Mr. J. Gwyn Jeffreys exhibited, on behalf of Sir J. Anderson, a fine specimen of the Felt or Blanket Sponge, *Askonema setubalanse*, Kent. This was obtained on the telegraph cable at the depth of 550 fathoms, off Cape Finistère, being picked up on the 24th of August, 1875. A mould of the upper surface of the cranium of the fossil Ornithocheirus, and various fragments of the skeleton, were exhibited and remarked on by Prof. Seeley. A paper was read, "On a New Genus of Turneraceæ from Rodriguez," by Mr. I. B. Balfour. This tree is known to the inhabitants as the "Bois Gaudine." It is small, handsome, with a very erect habit, the terminal branchlets being clothed with a light green foliage. The wood is light-coloured and fine grained, though not much used. It grows chiefly on the high grounds. This new genus Mathurina has close relationship to Erblichia, but differs manifestly from Turnera and Wormskioldia. Mr. J. S. Baker appended some remarks to the foregoing paper, stating Mr. Balfour's collection numbered 280 species of flowering plants and ferns. Of these, 110 were common weeds and 170 indigenous species to the island, whose entire area was about fifteen miles. The Flora of Rodriguez had now been fully settled by Mr. Balfour's researches, and indicated affinities to the temperate region. A paper "On Pollen" was communicated by Mr. M. P. Edgworth. The pollen grains of some 400 species have been carefully drawn to scale by the author, those of the main orders of plants bearing comparison. Some families have these bodies variable in form, others are tolerably uniform. "Notes on Algæ found at Kerguelen Land by the Rev. A. E. Eaton," by Prof. Dickie. In this paper, three new species, *Sphacelaria corymbosa*, *Melobesia kerguelena*, and *Ptilota Eatoni* are described. The total Algæ recorded are 65: of these 16 belong to the olive, 34 to the red, and 15 to the green series; 9 are peculiar to the island, 21, or about one-third, are also found on European shores. "A list of the Musci and Hepaticæ collected in Kerguelen Island by the Rev. A. E. Eaton," by Mr. W. Mitten. This list contains reference to 38 mosses and 13 liverworts. Of the former *Bryum Eatoni*, of the latter *Tylimanthus viridis* and *Balantiopsis incarassata*, are new to science. Mr. Carruthers exhibited specimens of *Phytophthora infestans*, *Pythium vexans*, and other parasitic fungi, prepared by Prof. de Bary, of Strasbourg.

SOCIETY OF ARTS.

February 11th.—Mr. J. G. Hepburn in the chair.—The paper read was, "Sole-Leather Tanning, with some Remarks on the Import of Hides and Cattle," by Mr. S. Evans.

February 15th.—Mr. F. Galton in the chair.—The paper read was, "On the Progress and Prospects of Ostrich Farming in the Cape Colony, and the Trade in Ostrich Feathers," by Mr. P. L. Simmonds.

February 16th.—Sir F. C. Knowles, Bart., in the chair.—The paper read was, "The Combustion of Coal Gas to Produce Heat, and the Theory of the Structure of Flames," by Mr. J. Wallace.

February 18th.—Mr. M. E. Grant Duff, M.P., in the chair.—The paper read was, "On the Commercial Aspects of the Suez Canal," by Mr. C. Magniac.

February 23rd.—Mr. C. S. Read, M.P., in the chair.—The paper read was, "Contagious Diseases of Animals as affecting the Health and Wealth of the Country," by Mr. G. Fleming.

February 24th.—Mr. A. Cassels in the chair.—The adjourned discussion on Mr. Magniac's paper, "On the Suez Canal," was concluded.

February 25th.—Mr. C. W. Siemens in the chair.—The paper read was, "On some Recent Metallurgical Processes," by Mr. J. A. Phillips. The waste from iron pyrites, after the extraction of the sulphur, is treated by a precipitation process, for the copper, containing a small percentage of gold and silver, which is afterwards extracted. A certain amount of iron is also recovered.

March 1st.—General Cotton in the chair.—The paper read was, "On Aquarium Construction and Management," by Mr. W. Saville-Kent. Mr. Kent dwelt chiefly on the history of aquaria, and advocated the reduction, if not the total abolition of the large reservoirs for storage of water generally employed.

March 3rd.—Lord Borthwick in the chair.—The paper read was, "On the Fall in the Price of Silver," by Mr. E. Seyd.

March 7th.—Mr. A. Cassels in the chair.—Adjourned discussion on Mr. Seyd's paper "On the Fall in the Price of Silver."

March 8th.—General Cotton in the chair.—The paper read was "On the Hall-Marking of Jewellery," by Mr. A. Lutschaunig.

March 13th.—Lord A. Churchill in the chair.—Adjourned discussion on Mr. Seyd's paper "On the Fall in the Price of Silver."

March 14th.—N. S. Maskelyne, Esq., in the chair.—The paper read was "The Diamond Fields of Griqualand, and their probable Influence on the Native Races of South Africa," by Mr. J. B. Currey.

March 15th.—H. R. Lack, Esq., in the chair.—The paper read was "On a New Bridge for Providing for the Traffic across the Thames below London Bridge," by Mr. F. Barnett. The proposed bridge would be double for a short distance in the middle, so that each arm could be alternately closed for traffic, and a drawbridge therein opened to allow vessels to pass into the space between the two arms, and thence to the other side of the bridge.

PHOTOGRAPHIC SOCIETY.

March 14th.—J. Glaisher, Esq., President, in the chair.—Discussion on Herr Leon Warnerke's paper "On Improvements in Collodion Emulsions," in which Col. Stuart Wortley, Mr. J. Spiller, and others took part. Herr Warnerke read another paper, describing further investigations on the same subject. A paper was read by Capt. Abney "On Photographing the Ultra Red Spectrum."

ASIATIC SOCIETY.

February 21st.—Sir E. Colebrook, Bart., M.P., in the chair. Letters were read from Sir Drummond Hay and M. Tissot, the English and French Ministers respectively at Tangier, stating that, from the reports of the caravans to Timbuctoo, there was reason to suppose that an obelisk existed, covered with written characters, near the intersection of the 25° N. lat. and the 13 W. long. parall., together with a large collection of MSS. at a village called Tisheet, about half-way between Timbuctoo and Arguin, on the coast. The characters on the obelisk Sir D. Hay suspects to be Lybian.

ON EVAPORATION AND ON PERCOLATION.

By Mr. Charles Greaves, M. Inst. C.E.

This paper, recently read at the Institution of Civil Engineers, treated only of evaporation due to natural influences, from observations at Lea Bridge. It contained a proposal to gauge, by an apparatus as simple as an ordinary rain gauge, the loss of water from the re-evaporation of rain; the usual method of learning the hygrometric state of the air being by the dry and wet bulb thermometers. The gauges included a percolation gauge, which was larger but did not differ greatly from the Dalton gauge, started by the late Mr. Dickenson at Abbots Langley, to which the author had added one filled with fine sand to ascertain maximum percolation. Lastly, evaporation from a surface of water was determined by floating the gauge in a vessel, or in some river, open tank, or reservoir, and it was assumed that the water in the inner vessel acquired the general conditions of that in the outer vessel. The rain gauge and percolation gauges were not new, but the form employed for determining the amount of evaporation from a surface of water had not been proposed elsewhere; moreover, the four series of observations had never been brought forward in juxtaposition and with apparatus of uniform construction.

Tables were submitted of the rainfall from observations uninterruptedly maintained since 1855; of the percolation, which by subtraction showed the evaporation from the ground, since 1855; of the percolation through sand, which furnished also the evaporation from sand, since 1860; and of the evaporation from a surface of water. The author gave the average rainfall as 25 inches, the average percolation through sand as 20 inches, and the evaporation from a surface of sand as 5 inches; percolation through earth as 7 inches; evaporation from a surface of earth as 18 inches; evaporation from a surface of open water $20\frac{1}{2}$ inches; and the gain of water in an open tank $4\frac{1}{2}$ inches only. These tables showed that all the water that could be relied upon as retained for use was a depth of 7 inches, if the rain fell on a permeable soil, and of $4\frac{1}{2}$ inches if it fell on an open tank or reservoir. To secure more than this, covered reservoirs or close vessels to prevent evaporation would be necessary. The principal deduction from the facts observed had been the smallness of the remainder of the rain water left after the influence of evaporation had been felt, and this was noticeable whether the water had been at once stored in reservoirs or had been allowed to sink into the porous earth and was stored there. In either case the proportion unevaporated was small, the average annual result from fourteen years' observations showing 5·108 inches of water as added to an open water surface, and 7·582 inches as absorbed by the ground, the results of nineteen years and twenty-two years indicating still less, as had been mentioned. Certain geographical limits must be given to these data, which, excluding Wales, Devon, and Cornwall, would probably be applicable over all the south of England, and as far north as the Trent and Severn. The northern counties, Scotland, and Ireland would have different ratios of evaporation, and doubtless the springs were better fed.

The phenomena of peculiar dry years—years in which the rivers and springs had been deficient, viz., 1861, 1864, 1868, were discussed. Springs and rivers had been redundant in 1852-53, in 1857-58, in 1860, in 1866, and in 1872. It was manifest that with a view to provide for the permanent and continuous needs of large communities, the probable fluctuation of delivery of water in a river might be gathered by watching closely the sequence indicated by the percolation gauge. Heavy rains and storms in summer might produce a river flood, yet fail to replenish the springs; and a long frost, even with considerable snow, might leave rivers and springs very short of water for the following autumn; and a dry winter imperilled the permanence of river discharge more than a hot summer. The latter, however, might succeed a dry winter, under which circumstances the deficiency of water in the rivers must become alarming, in view of the present tendency to the aggregation of populations. One result of the comparisons deduced from the tables attached to the paper was, that the storage of water might be more safely and largely secured in a porous subsoil, covered with a turf surface, than in ponds, reservoirs, or other accumulations of open water. The author added that frequent thaws of small falls of snow produced the greatest amount of percolation; that hollow draining did not diminish the perennial flow of rivers; that capillarity had only a negative influence; and that the influence of a wet period on percolation rarely extended over more than one season, and was soon obliterated by a dry winter succeeding.

The flow of springs and of rivers followed the increase and decrease of percolation more closely than the rainfall, except in the temporary effects which immediately succeeded on copious rains. Negative evaporation, or an increment of water without rain, occasionally, though seldom, occurred in the floating gauge; but it was of frequent occurrence in the sand gauge, from the low temperature acquired by the sand by radiation, when the gauge became a dew tank.

THE "QUARTERLY REVIEW" ON MODERN METHODS IN NAVIGATION AND NAUTICAL ASTRONOMY.

By a Contributor.

In the current number of the *Quarterly Review* there is an article entitled "Modern Methods in Navigation and Nautical Astronomy," which certainly contains much interesting matter, but which also abounds in statements that are utterly untenable, and opposed to first principles so generally acknowledged as to be considered quite elementary in their character.

An exhaustive dissection of this dissertation is scarcely called for, but it seems expedient that such novel and startling assertions should not be unchallenged, being, as they are, antagonistic to any other authority, and misleading to those who may inbibe their notions of nautical astronomy from the exposition of views unique in their extreme *modernism*.

At page 150 we read: "Owing to the constant rotation of the earth, everything in the heavens seems to be in a state of constant change. Seen from some distant star, the whole would appear orderly and simple; seen from our whirling globe, on which *every inhabitant presents his head and his heels alternately to a given spot in space*, all these movements, &c.;" and further on, "At this moment our head is turned towards some particular star. Twelve hours hence our feet will point towards that *same star*." That this should be published for a fact to be assented to by the general reader, is an insult to the intelligence of those who have given but even small attention to astronomy. There are doubtless some, however, who require a little assistance in reasoning out the absurdity contained in the extracts quoted, and these we desire to assist.

Let us, then, for instance, take the case of people living near the Lizard Point, England; or at St. Agnes, Scilly Islands, who have the star η Ursæ Majoris (Benetnasch) *immediately* over their heads once every day. How can their feet point to it when the star to them *never sets*, but is always 10° (about) or more above their horizon? To take another example: Our feet in England, once every twenty-four hours, point (nearly) to, a Gruis, f Crucis, a Pavonis, &c., yet these stars *never* rise above our horizon; but perhaps the most simple confutation can be given by asking how the feet of Captain Nares and his fellow-explorers are to point to the North Star, unless they reverse their usual position, and stand upon their heads? In fact, a rule has been made out of the only exception to the rule. People on the *Equator* have their heads and feet alternately pointing to the same spot in the heavens at intervals of twelve hours, and this can occur nowhere else while the world continues to rotate on its polar axis.

At pages 150-151 one also sees the following:—"Everyone knows, of course, that his zenith is that *part* of the heavens which is immediately vertical to him." "At midsummer in England we see the noon-day sun apparently about *half-way* in the heavens between our zenith and horizon. At that moment a man on *the Equator sees it exactly in his zenith*, *one at the Pole sees it on his* horizon, &c.

Now the zenith of any person is a *point*, and consequently without *parts*.

The sun at midsummer reaches (at London) a maximum altitude of 62°, at which moment to a man on the Equator the sun's altitude will be only $4\frac{1}{2}°$ greater, and consequently *not in his zenith*; while the man at the (North) Pole under the same conditions will see the sun with an altitude of $23\frac{1}{2}°$, *and not on his horizon*. If the writer of the article in question were correct, the Polar expedition would have no light season for exploration; no day at all in fact, since the sun would only just touch their horizon on the 21st June, and then depart for a year (if we take the extreme attainable latitude as their position, to exemplify the case).

At page 151, there is another startling statement, worse, if possible, than those that precede it. "As each person, however close together, has a different zenith, so each *must have a different meridian*." If we consider the earth a sphere, a meridian is defined as a great circle passing through the poles, but we can only take one half of this, the semi-circle on either side of the sphere as a meridian in the following reasoning:—Let us take any meridian; say that of the Monument of London; now, this meridian then passes through the Monument, and extends to either Pole. Suppose that along the whole length of this meridian men were placed side by side, and that we allot two feet to each as standing room; it is evident that thirty-three million men (since the semi-circumference of the globe is about 12,500 miles, composed of 5,280 feet, $\frac{5{,}280 \times 12{,}500}{2} = 33{,}000{,}000$), could stand upon it, or rather stand in such a position as to have a common meridian.

Though not desirous of cavilling at the remark made on page 152, "that the declination of the stars is *invariable*," one must say that it was imprudent to advance this assertion in a scientific paper. The annual variation of any fixed star is certainly very small, but still it would in many cases, if not allowed for, in a few years, lead to considerable errors in results obtained by star observations.

It is difficult to conceive any circumstances that could have induced a writer to make such a string of exceptional statements as those adverted to; and it occasions surprise in finding them in the *Quarterly Review*.

HORSE CLEANING BY MACHINERY.

A test trial of Newton Wilson and Co.'s "patent horse and cattle groomer" has taken place in the Agricultural Hall, with satisfying results, in presence of representatives of the London General Omnibus Company, the Great Northern Railway Company, and Messrs. Meade and Co., the contractors; of Captain Barthop, Mr. A. H. Boylan, superintendent of the Midland Railway Company, many members of the Royal College of Veterinary Surgeons, and several non-commissioned officers of the 1st Life Guards. The object of the new apparatus is to supersede the present mode of grooming by a revolving brush of bristles worked on much the same principle as that employed in hair-dressing by machinery, with the exception that the rotary motion can be reversed by means of a spherical handle, which can be put at an angle. The machine is simple and portable, being no bigger than an ordinary grindstone, and can be driven by hand or steam. The currycomb and wisp are entirely dispensed with, and from what was practically shown on horses belonging to the Midland Railway Company, Messrs. Meade and Co., Mr. Weston, and Messrs. Raffity and Sharman, of the Agricultural Hall, there can be no question that the grooming can be done expeditiously and much more thoroughly than by hand. The animals were brought in from the streets, and for the most part took the operation very easily. After a few minutes under the brush, which they seemed to like as soon as the novelty had worn off, they were turned out as glossy as varnish. Not a greasy stain would come off on a silk handkerchief. The gain of this novel invention appears, says the *Standard*—which furnishes us with much of the above information—to be less in the saving of labour and time than in the effective manner in which their skin was cleaned. The coat, of course, is rendered shiny, that can be produced by malt, or balls, or heat (all of which are injurious to a horse's health); but skin with the scurf driven out from the roots of the hair is a desideratum which the owners of many studs sigh for in vain. Very good judges consider that a neglected animal could be brought into better condition in a quarter the time by "the groomer" than by any amount of grooming in the ordinary way. The machine is sure to come into vogue in all large stables.

Plough Handle.—William A. Couch, of Hannibal, U.S., has invented an open work metal handle, easily attached to the upright of the plough stock by a single bolt. The novelty lies in the construction, which is such as to ensure strength as well as lightness.

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